



Choose the correct answer, two marks for each question

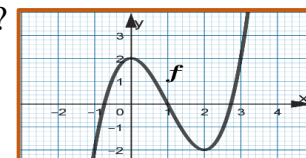
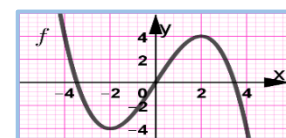
- Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
 A. 30 B. 10 C. $\frac{28}{3}$ D. 28
 - Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6
 - Which of the following function is odd ?
 A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
 C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$
 - Use the given graph to find the value of b if you know that $f(g(b)) = 1$.
 A. $b = 1$ B. $b = 0$
 C. $b = 3$ D. $b = 4$
-
- What is the domain of the function $f(x) = \sqrt{4-x^2}$?
 A. $]-\infty, -2] \cup [2, +\infty[$ B. R C. $]-2, 2[$ D. $[-2, 2]$
 - Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$
 - Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.
 A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$
 - For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12
 - Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0
 - If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0
 - If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$
 - Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$
 - Determine the two functions of the following that match at all value of x with the exception of $x = 1$.
 A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x+1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x}+1$
 C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2-x+1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x-2$
 - Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
 A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $]-\infty, 0]$

15. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$

B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

- Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2 ?
 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
- If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$ knowing that $f'(5) = 4$ and $g(-2) = 5$.
 A. 3 B. $\frac{5}{12}$ C. 7 D. 5
- Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
- If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.
 A. 10 B. 21 C. 31 D. 35
- Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.
 A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
- Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
 A. $\{(-3, 4), (3, -4)\}$ B. $\{(4, -3), (-4, -3)\}$ C. $\{(-4, 3), (4, -3)\}$ D. $\{(4, 3), (-4, -3)\}$
- If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?
 A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
 C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$
- Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x - 1}$.
 A. $y = -1, y = 2$ B. $y = -1, y = 0$ C. $y = 0, y = 2$ D. $y = 1, y = 0$
- Use the given graph of the function f , find the value of x where $f'(x) = 0$.
 A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)
- On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing ?
 A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$
- Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
 A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$
- Find the point of inflection for $f(x) = x^3 + 3x^2$.
 A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$
- Use the given graph of the function $y = f(x)$. Which of the following is false?
 A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) \leq 0$ D. $f''(-1) < f''(3)$



29. Find the value of $\int_1^2 \left(\frac{3}{x^2} - 2\right) dx$. A. $\frac{1}{2}$ B. $-\frac{21}{2}$ C. $-\frac{1}{2}$ D. $\frac{21}{2}$
30. Find the value of $\int \frac{2-3\cos x}{4} dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$
31. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
32. Find the value of $\int_1^3 \ln 9x dx$.
A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$
33. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.
A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$
34. The graph on the right shows the graph of the function f' .
On which interval is the function f concave?
A. $]-\infty, -2[$ B. $]2, +\infty[$
C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$
35. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is :
A. 1 B. -1 C. 2 D. -2
36. The graph on the right shows the graph of f , determine the graph of its derivative.
37. Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$.
A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$
38. A man looks at a plane in the sky, at a horizontal distance of $600 m$, with an inclination angle of 30° . What is the altitude of the plane?
A. $600\sqrt{3} m$ B. $200\sqrt{3} m$ C. $200 m$ D. $600\sqrt{2} m$
39. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$.
Find the distance between the point B and the line $x - 3y = -14$.
A. 10 B. $\frac{18}{\sqrt{10}}$
C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$
40. The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.
A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

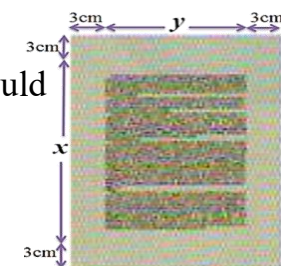
41. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$
42. Use the given graph on the right, which of the following is false?
A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$
43. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.
A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$
44. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
A. $12 m/s^2$ B. $6 m/s^2$ C. $18 m/s^2$ D. $0 m/s^2$
45. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.
A. 1 B. 0 C. 2 D. $\frac{1}{2}$
46. A graphic is designer is planning to design a rectangular page that should contain $289 cm^2$ of print. Each of the four margins is to be $3cm$ wide. What should the dimensions of the page be so that the least amount of paper is used?
47. Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.
A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
48. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.
49. Find the value for the multiplication of $f''(2) g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
A. -2 B. 1 C. 4 D. -4
50. Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
A. -2 B. 2 C. 5 D. 10



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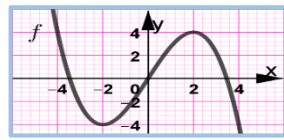
- Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
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- The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$.
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 A. 12 m/s² B. 6 m/s² C. 18 m/s² D. 0 m/s²
- Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$.
 A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0
- Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$.
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- Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
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- Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$.
 A. B. C. D.
- Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
 A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$
- If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$.
 A. $-\infty$ B. $+\infty$ C. -1 D. 0

- If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.
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- Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.
 A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
- Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
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- Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.
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 C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$
- Which of the following function is odd?
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 C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$
- Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.
 A. B. C. D.
- Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
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- Use the intermediate vale theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2?
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- If $f(x) = x\sqrt{x}$, find the value of $f'(1)$.
 A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$
- Determine the two functions of the following that match at all value of x with the exception of $x = 1$.
 A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
 C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$
- On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing?
 A. $] -\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$



26. Use the given graph of the function f , find the value of x where $f'(x) = 0$.

- A. $x = -2$ B. $x = 2$
C. $x = 0$ D. both (A and B)

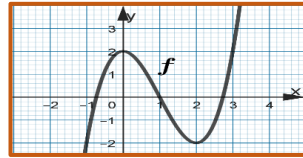


27. Find the value of $\int_1^2 \int (\frac{3}{x^2} - 2) dx$. A. $\frac{1}{2}$ B. $-\frac{21}{2}$ C. $-\frac{1}{2}$ D. $\frac{21}{2}$

28. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:
A. 1 B. -1 C. 2 D. -2

29. Use the given graph of the function $y = f(x)$. Which of the following is false?

- A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
C. $f''(2) < 0$ D. $f''(-1) < f''(3)$



30. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.

- A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$

31. Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$

32. Find the value of $\int \frac{2-3\cos x}{4} dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

33. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$. A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$

34. What is the domain of the function $f(x) = \sqrt{4-x^2}$?

- A. $]-\infty, -2] \cup [2, +\infty[$ B. R C. $]-2, 2[$ D. $[-2, 2]$

35. A man looks at a plane in the sky, at a horizontal distance of 600 m, with an inclination angle of 30° . What is the altitude of the plane?

- A. $600\sqrt{3} m$ B. $200\sqrt{3} m$ C. $200 m$ D. $600\sqrt{2} m$

36. Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$

37. Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
A. -2 B. 1 C. 4 D. -4

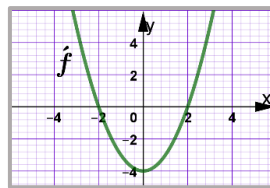
38. Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.

- A. $\{(-3, 4), (3, -4)\}$ B. $\{(4, -3), (-4, -3)\}$ C. $\{(-4, 3), (4, -3)\}$ D. $\{(4, 3), (-4, -3)\}$

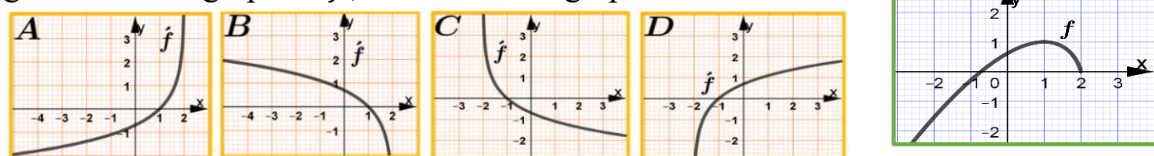
39. The graph on the right shows the graph of the function f' .

On which interval is the function f concave?

- A. $]-\infty, -2[$ B. $[2, +\infty[$
C. $]-\infty, -2[\cup [2, +\infty[$ D. $[0, +\infty[$



40. The graph on the right shows the graph of f , determine the graph of its derivative.



41. Find the value of $\int_1^3 \ln 9x dx$.

- A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$

42. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.

- A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$

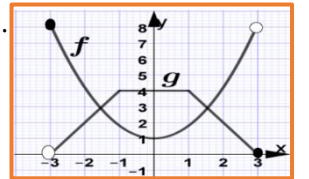
43. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6

44. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

- A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$

45. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.

- A. $b = 1$ B. $b = 0$
C. $b = 3$ D. $b = 4$



46. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

- A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

47. Find the point of inflection for $f(x) = x^3 + 3x^2$.

- A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$

48. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x-1}$.

- A. $y = -1, y = 2$ B. $y = -1, y = 0$ C. $y = 0, y = 2$ D. $y = 1, y = 0$

49. The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.

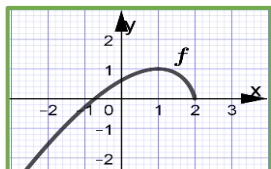
- A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

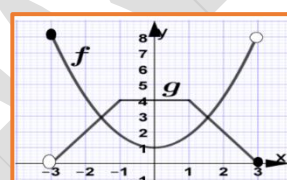
50. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.

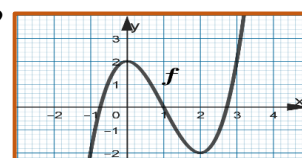
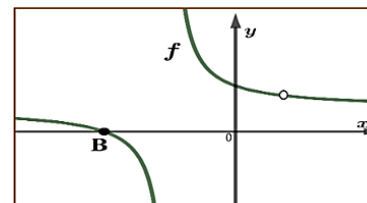
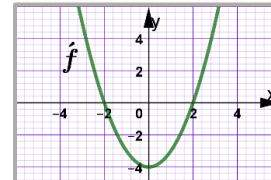
- A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$



Choose the correct answer, two marks for each question

- Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.
 A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
- The graph on the right shows the graph of f , determine the graph of its derivative.


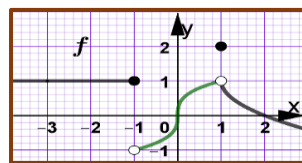
- Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$.
 A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$
- Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.
 A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
- A graphic is designer is planning to design a rectangular page that should contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?
 A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
 C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$
- Use the intermediate vale theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2 ?
 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
- Use the given graph to find the value of b if you know that $f(g(b)) = 1$.

 A. $b = 1$ B. $b = 0$
 C. $b = 3$ D. $b = 4$
- The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.
 A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2
- On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing ?
 A. $] -\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$
- Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$

- Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
 A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$
- Use the given graph of the function $y = f(x)$. Which of the following is false?

 A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$
- Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$.
 A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6
- Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$.
 A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0
- If $f(x) = x\sqrt{x}$, find the value of $f'(1)$.
 A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$
- For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12
- The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.

 A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$
- The graph on the right shows the graph of the function f' . On which interval is the function f concave?

 A. $] -\infty, -2[$ B. $]2, +\infty[$
 C. $] -\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$
- If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is :
 A. 1 B. -1 C. 2 D. -2
- If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
 A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
- If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?
 A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
 C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$
- Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
 A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0]$
- Find the value of $\int_1^2 \int_{x^2}^{\frac{3}{x^2}-2} dx$.
 A. $\frac{1}{2}$ B. $-\frac{21}{2}$ C. $-\frac{1}{2}$ D. $\frac{21}{2}$
- If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.
 A. 10 B. 21 C. 31 D. 35

25. Use the given graph on the right, which of the following is false?

A. $\lim_{x \rightarrow 1^-} f(x) = 1$
C. $\lim_{x \rightarrow -1^+} f(x) = -1$

B. $\lim_{x \rightarrow 2} f(x) = 0$
D. $\lim_{x \rightarrow 1} f(x) = f(1)$



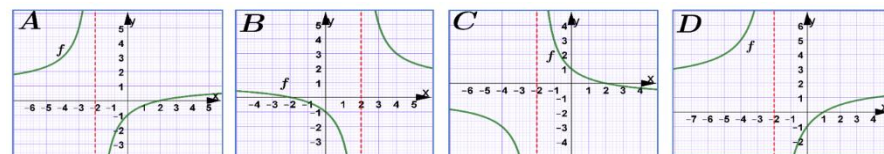
26. Find the value of $\int_1^3 \ln 9x \, dx$.

A. $\ln 9x - 2$ B. $9 \ln 3x - 2$ C. $7 \ln 3x + 2$ D. $7 \ln 3x - 2$

27. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.

A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$

28. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$.



29. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$.

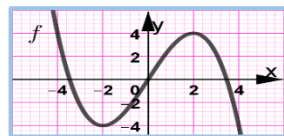
Knowing that $f'(5) = 4$ and $g(-2) = 5$. A. 3 B. $\frac{5}{12}$ C. 7 D. 5

30. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.

A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$

31. Use the given graph of the function f , find the value of x where $f'(x) = 0$.

A. $x = -2$ B. $x = 2$
C. $x = 0$ D. both (A and B)



32. Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$.

A. -2 B. 1 C. 4 D. -4

33. A man looks at a plane in the sky, at a horizontal distance of 600 m, with an inclination angle of 30° . What is the altitude of the plane?

A. $600\sqrt{3} \, m$ B. $200\sqrt{3} \, m$ C. $200 \, m$ D. $600\sqrt{2} \, m$

34. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.

A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$

35. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.

A. 1 B. 0 C. 2 D. $\frac{1}{2}$

36. What is the domain of the function $f(x) = \sqrt{4 - x^2}$?

A. $]-\infty, -2] \cup [2, +\infty[$ B. $\mathbb{R}$ C. $]-2, 2[$ D. $[-2, 2]$

37. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$

38. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.

A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$

39. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x-1}$.

A. $y = -1$, $y = 2$ B. $y = -1$, $y = 0$ C. $y = 0$, $y = 2$ D. $y = 1$, $y = 0$

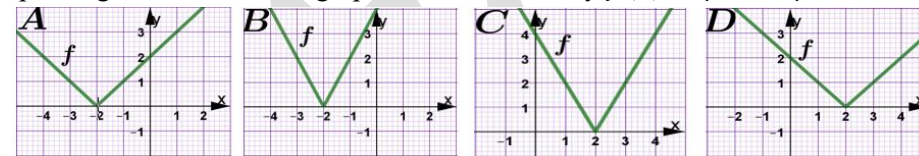
40. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

41. Find the point of inflection for $f(x) = x^3 + 3x^2$.

A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$

42. Use point-plotting to determine the graph of the function by $f(x) = |x-2|$.



43. Which of the following function is odd? A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$

C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$

44. Find the value of $\int \frac{2-3\cos x}{4} \, dx$.

A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

45. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$.

A. $-\infty$ B. $+\infty$ C. -1 D. 0

46. Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.

A. -2 B. 2 C. 5 D. 10

47. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.

A. 30 B. 10 C. $\frac{28}{3}$ D. 28

48. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.

A. $12 \, m/s^2$ B. $6 \, m/s^2$ C. $18 \, m/s^2$ D. $0 \, m/s^2$

49. Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$.

A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$

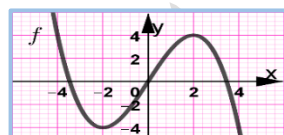
50. Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$.

A. 1 B. 0 C. -1 D. $\frac{1}{2}$

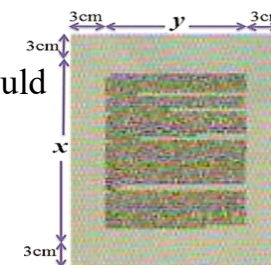


Choose the correct answer, two marks for each question

- Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
- Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
A. 30 B. 10 C. $\frac{28}{3}$ D. 28
- If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
- The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.
A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2
- Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6
- If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0
- Use the given graph of the function f , find the value of x where $f'(x) = 0$.
A. $x = -2$ B. $x = 2$
C. $x = 0$ D. both (A and B)
- Determine the two functions of the following that match at all value of x with the exception of $x = 1$.
A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$
- Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2 ?
A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
- If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?
A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$
- Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^x+1}{e^x-1}$.
A. $y = -1$, $y = 2$ B. $y = -1$, $y = 0$ C. $y = 0$, $y = 2$ D. $y = 1$, $y = 0$



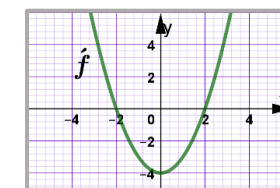
- A graphic designer is planning to design a rectangular page that should contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?



- A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
 C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$

- For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
A. 3 B. 4 C. 6 D. 12

- The graph on the right shows the graph of the function f' . On which interval is the function f concave?



- A. $]-\infty, -2[$ B. $]2, +\infty[$
 C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$

- Find the value of $\int_1^3 \ln 9x \, dx$.
A. $\ln 9x - 2$ B. $9 \ln 3x - 2$ C. $7 \ln 3x + 2$ D. $7 \ln 3x - 2$
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$
- If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$

- What is the domain of the function $f(x) = \sqrt{4-x^2}$?
A. $]-\infty, -2] \cup [2, +\infty[$ B. $\mathbb{R}$ C. $]-2, 2[$ D. $[-2, 2]$

- Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$

- If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:
A. 1 B. -1 C. 2 D. -2

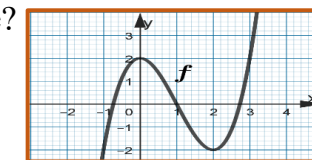
- A man looks at a plane in the sky, at a horizontal distance of 600 m , with an inclination angle of 30° . What is the altitude of the plane?

- A. $600\sqrt{3} \text{ m}$ B. $200\sqrt{3} \text{ m}$ C. 200 m D. $600\sqrt{2} \text{ m}$

- Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0

- On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing?
A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$

- Use the given graph of the function $y = f(x)$. Which of the following is false?

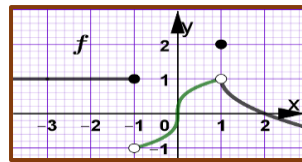


- A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$

25. Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
- A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$

26. Use the given graph on the right, which of the following is false?

- A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$



27. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

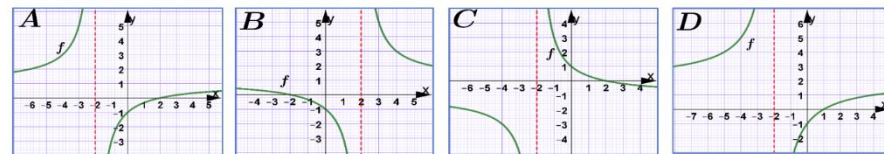
- A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

28. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.
- A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$

29. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.

- A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$

30. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$

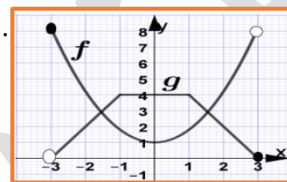


31. Find the point of inflection for $f(x) = x^3 + 3x^2$.

- A. (2, -1) B. (-1, 2) C. (1, 4) D. (-1, 4)

32. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.

- A. $b = 1$ B. $b = 0$
 C. $b = 3$ D. $b = 4$



33. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.

- A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$

34. Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.

- A. -2 B. 2 C. 5 D. 10

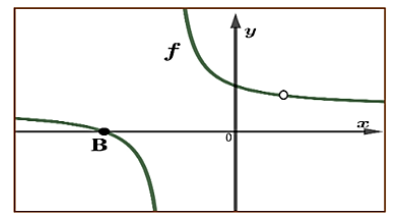
35. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.

- A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$

36. Which of the following function is odd?
- A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
 C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$

37. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.

- A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$



38. Find the value of a when $x = -1$ is being the vertical asymptote of

- function $f(x) = \frac{3x-15}{x^2+3x+a}$. A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$

39. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$

- Knowing that $f'(5) = 4$ and $g(-2) = 5$. A. 3 B. $\frac{5}{12}$ C. 7 D. 5

40. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.

- A. (0, 2) B. (2, 0) C. (-2, 0) D. (0, 4)

41. Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?

- A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0]$

42. Find the value of $\int_1^2 \left(\frac{3}{x^2} - 2\right) dx$. A. $\frac{1}{2}$ B. $-\frac{21}{2}$ C. $-\frac{1}{2}$ D. $\frac{21}{2}$

43. Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.

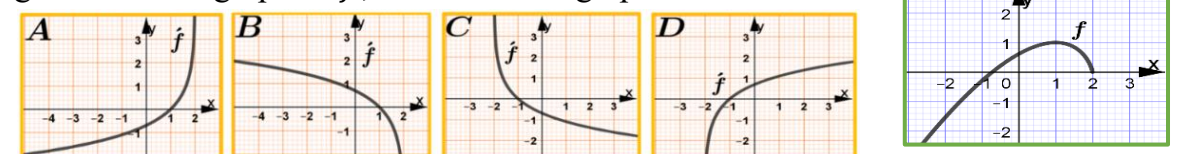
- A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $-\frac{x}{3} + \frac{y}{2} = 1$

44. Find the value of $\int \frac{2-3\cos x}{4} dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
 C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

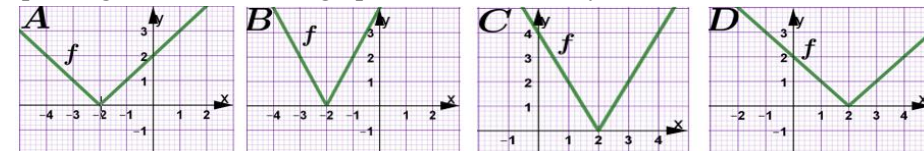
45. Find the value for the multiplication of $f''(2) g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$

- A. -2 B. 1 C. 4 D. -4

46. The graph on the right shows the graph of f , determine the graph of its derivative.



47. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.



48. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$. A. 1 B. 0 C. 2 D. $\frac{1}{2}$

49. If $\int_{-1}^1 f(x) dx = 5$ and $\int_{-1}^1 h(x) dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)] dx$.

- A. 10 B. 21 C. 31 D. 35

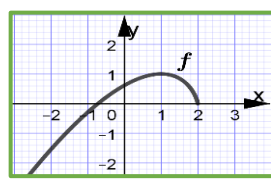
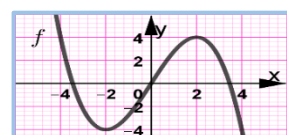
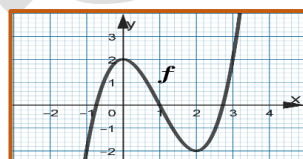
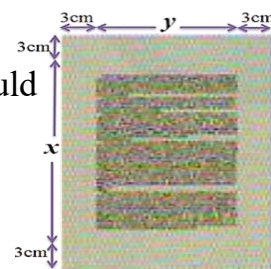
50. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.

- A. 12 m/s^2 B. 6 m/s^2 C. 18 m/s^2 D. 0 m/s^2

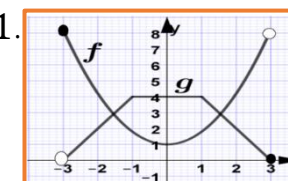


Choose the correct answer, two marks for each question

- Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
 A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0]$
- If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.
 A. 10 B. 21 C. 31 D. 35
- Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.
 A. 1 B. 0 C. 2 D. $\frac{1}{2}$
- Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$.
 A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$
- A graphic is designer is planning to design a rectangular page that should contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?
 A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
 C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$
- Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
 A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$
- For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?
 A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$
- Use the given graph of the function $y = f(x)$. Which of the following is false?
 A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$
- Use the given graph of the function f , find the value of x where $f'(x) = 0$.
 A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)
- The graph on the right shows the graph of f , determine the graph of its derivative.
 A. B. C. D.
- Find the point of inflection for $f(x) = x^3 + 3x^2$.
 A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$



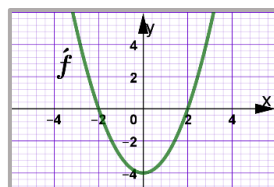
- Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.
 A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$
- Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$.
 A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
- Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.
 A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$
- Which of the following function is odd?
 A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
 C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$
- An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
 A. 12 m/s^2 B. 6 m/s^2 C. 18 m/s^2 D. 0 m/s^2
- Find the value of $\int_1^2 \left(\frac{3}{x^2} - 2\right) dx$.
 A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$
- Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
 A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$.
 A. 1 B. 0 C. -1 D. $\frac{1}{2}$
- Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
 A. -2 B. 2 C. 5 D. 10
- Use the given graph to find the value of b if you know that $f(g(b)) = 1$.
 A. $b = 1$ B. $b = 0$
 C. $b = 3$ D. $b = 4$
- Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.
 A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
- A man looks at a plane in the sky, at a horizontal distance of 600 m , with an inclination angle of 30° . What is the altitude of the plane?
 A. $600\sqrt{3} \text{ m}$ B. $200\sqrt{3} \text{ m}$ C. 200 m D. $600\sqrt{2} \text{ m}$
- Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.
 A. B. C. D.
- Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
 A. 30 B. 10 C. $\frac{28}{3}$ D. 28
- Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2?
 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$



27. The graph on the right shows the graph of the function f' .

On which interval is the function f concave?

- A. $]-\infty, -2[$ B. $]2, +\infty[$
C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$



28. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0

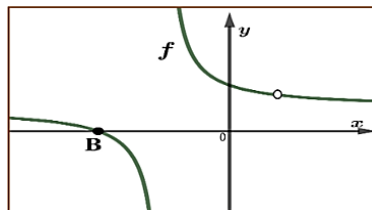
29. The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.

- A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

30. The figure on the right shows the graph of the function $f(x) = \frac{x^2 + 2x - 8}{x^2 - 4}$.

Find the distance between the point B and the line $x - 3y = -14$.

- A. 10 B. $\frac{18}{\sqrt{10}}$
C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$



31. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

- A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x + 4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x - 4}$
C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x - 4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x + 4}$

32. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:

- A. 1 B. -1 C. 2 D. -2

33. Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.

- A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$

34. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$

35. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

- A. $f(x) = \frac{x^2 - 1}{x + 1}$, $g(x) = x + 1$ B. $f(x) = \frac{x - 1}{\sqrt{x} - 1}$, $g(x) = \sqrt{x} + 1$
C. $f(x) = \frac{x^3 - 1}{x - 1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2 - 4}{x - 2}$, $g(x) = x - 2$

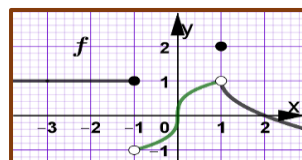
36. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.

- A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$

37. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6} - 3}{x-3}$. A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6

38. Use the given graph on the right, which of the following is false?

- A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$



39. On which interval is the function $f(x) = e^{(x^3 - 3x^2)}$ decreasing?

- A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$

40. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x - 1}$.

- A. $y = -1$, $y = 2$ B. $y = -1$, $y = 0$ C. $y = 0$, $y = 2$ D. $y = 1$, $y = 0$

41. For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2 - 3x - 9}{x - 3} & x \neq 3 \\ bx - 3 & x = 3 \end{cases}$ have no points of discontinuity?

- A. 3 B. 4 C. 6 D. 12

42. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$.

Knowing that $f'(5) = 4$ and $g(-2) = 5$. A. 3 B. $\frac{5}{12}$ C. 7 D. 5

43. Find the value of $\int_1^3 \ln 9x \, dx$.

- A. $\ln 9x - 2$ B. $9 \ln 3x - 2$ C. $7 \ln 3x + 2$ D. $7 \ln 3x - 2$

44. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0

45. Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$.

- A. -2 B. 1 C. 4 D. -4

46. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.

- A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$

47. Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.

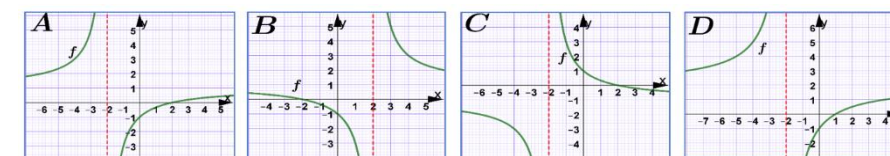
- A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$

48. What is the domain of the function $f(x) = \sqrt{4 - x^2}$?

- A. $]-\infty, -2] \cup [2, +\infty[$ B. R C. $]-2, 2[$ D. $[-2, 2]$

49. Find the value of $\int \frac{2 - 3\cos x}{4} \, dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

50. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$.



A graph showing two functions, f and g , on a Cartesian coordinate system. The x-axis ranges from -3 to 3, and the y-axis ranges from 0 to 8. Function f is a parabola opening upwards with its vertex at $(0, 1)$. It has a solid dot at $(-3, 8)$ and an open circle at $(3, 8)$. Function g is a piecewise linear function that is 0 on $[-3, -1]$, increases linearly from $(-1, 0)$ to $(1, 4)$, is constant at $y = 4$ on $[1, 2]$, and decreases linearly from $(2, 4)$ to $(3, 0)$. The intersection of f and g is at $(1, 4)$.

A. 30 B. 10 C. $\frac{28}{3}$ D. 28

A. $y = -4x - 4$ **B.** $y = -4x + 1$ **C.** $y = 4x - 4$ **D.** $y = 4x + 3$

A. $\frac{x}{3} - \frac{y}{2} = 1$ **B.** $\frac{x}{3} + \frac{y}{2} = -1$ **C.** $\frac{x}{2} + \frac{y}{3} = 1$ **D.** $\frac{-x}{3} + \frac{y}{2} = 1$

A. 1 **B. -1** **C. 2** **D. -2**

A. 12 m/s^2 **B.** 6 m/s^2 **C.** 18 m/s^2 **D.** 0 m/s^2

A. $\frac{1}{3}$ **B.** 2 **C.** $\frac{3}{2}$ **D.** $\frac{2}{3}$

A. $600\sqrt{3} \text{ m}$ **B.** $200\sqrt{3} \text{ m}$ **C.** 200 m **D.** $600\sqrt{2} \text{ m}$

A. $k = -1$ **B.** $k = -6$ **C.** $k = 1$ **D.** $k = 6$

A. $f(x) = x^2 - 3x + 1$ **B.** $f(x) = x^2 - 3x - 9$
C. $f(x) = 2x^2 - 3x + 1$ **D.** $f(x) = x^2 - 3x$

A. -2 **B.** 1 **C.** 4 **D.** -4

Right shows the graph of f , determine the graph of its derivative.

A

B

C

D

A. 2 **B.** $\frac{1}{2}$ **C.** $-\frac{1}{2}$ **D.** -2

f. $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. **A.** $-\infty$ **B.** $+\infty$ **C.** $-\frac{3}{2}$ **D.** $\frac{3}{2}$

A. $\frac{1}{2}$ **B.** $\frac{-21}{2}$ **C.** $\frac{-1}{2}$ **D.** $\frac{21}{2}$

A. $]0, 2[$ **B.** $]2, +\infty[$ **C.** $]0, +\infty[$ **D.** $] -\infty, 0]$

A. $(2, -1)$ **B.** $(-1, 2)$ **C.** $(1, 4)$ **D.** $(-1, 4)$

A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ **B.** $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ **C.** $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ **D.** $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$

A. $3 + e^2$ **B.** $4 + e^2$ **C.** e^2 **D.** $2 + e^2$

A. $(0, 2)$ **B.** $(2, 0)$ **C.** $(-2, 0)$ **D.** $(0, 4)$

A. $]-\infty, -2] \cup [2, +\infty[$ **B.** R **C.** $]-2, 2[$ **D.** $[-2, 2]$

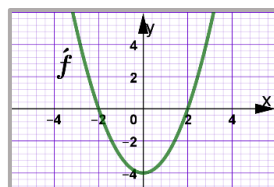
$$\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}.$$

A. 1 **B.** 0 **C.** -1 **D.** $\frac{1}{2}$

27. The graph on the right shows the graph of the function f' .

On which interval is the function f concave?

- A. $]-\infty, -2[$ B. $]2, +\infty[$
C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$



28. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$

Knowing that $f'(5) = 4$ and $g(-2) = 5$. A. 3 B. $\frac{5}{12}$ C. 7 D. 5

29. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$. A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$

30. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$. A. 1 B. 0 C. 2 D. $\frac{1}{2}$

31. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

- A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

32. Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2? A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$

33. On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing?

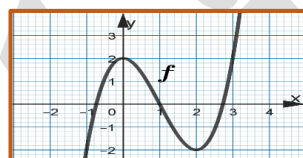
- A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$

34. Find the value of a when $x = -1$ is being the vertical asymptote of

function $f(x) = \frac{3x-15}{x^2+3x+a}$. A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$

35. Use the given graph of the function $y = f(x)$. Which of the following is false?

- A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
C. $f''(2) < 0$ D. $f''(-1) < f''(3)$

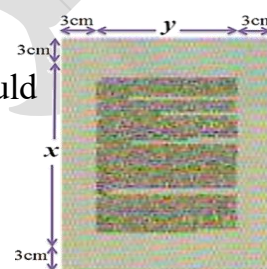


36. A graphic designer is planning to design a rectangular page that should

contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should

the dimensions of the page be so that the least amount of paper is used?

- A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$



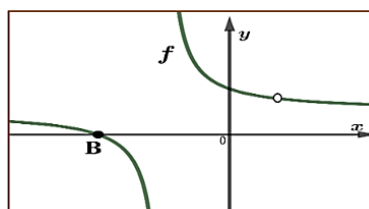
37. Find the value of $\int_1^3 \ln 9x \, dx$.

- A. $\ln 9x - 2$ B. $9 \ln 3x - 2$ C. $7 \ln 3x + 2$ D. $7 \ln 3x - 2$

38. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$

Find the distance between the point B and the line $x - 3y = -14$.

- A. 10 B. $\frac{18}{\sqrt{10}}$
C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$



39. If $\int_{-1}^1 f(x) \, dx = 5$ and $\int_{-1}^1 h(x) \, dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)] \, dx$.

- A. 10 B. 21 C. 31 D. 35

40. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.

- A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$

41. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x-1}$.

- A. $y = -1, y = 2$ B. $y = -1, y = 0$ C. $y = 0, y = 2$ D. $y = 1, y = 0$

42. Find the value of $\int \frac{2-3\cos x}{4} \, dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

43. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

- A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$

44. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $\frac{-1}{6}$ C. $\frac{1}{6}$ D. 6

45. Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.

- A. -2 B. 2 C. 5 D. 10

46. For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?

- A. 3 B. 4 C. 6 D. 12

47. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0

48. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0

49. Which of the following function is odd? A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$

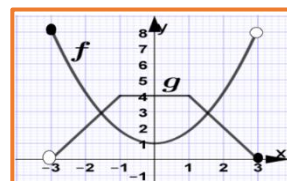
50. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

- A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$

Choose the correct answer, two marks for each question

1. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.

A. $b = 1$ B. $b = 0$
 C. $b = 3$ D. $b = 4$



2. Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.

A. -2 B. 2 C. 5 D. 10

3. A man looks at a plane in the sky, at a horizontal distance of 600 m , with an inclination angle of 30° . What is the altitude of the plane?

A. $600\sqrt{3}\text{ m}$ B. $200\sqrt{3}\text{ m}$ C. 200 m D. $600\sqrt{2}\text{ m}$

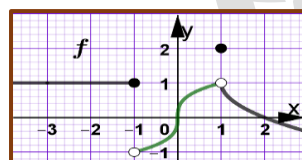
4. Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$

5. Find the value of $\int \frac{2-3\cos x}{4} dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
 C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

6. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0

7. Use the given graph on the right, which of the following is false?

A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$



8. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
 C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$

9. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.

A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$

10. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$

11. What is the domain of the function $f(x) = \sqrt{4-x^2}$?

A. $]-\infty, -2] \cup [2, +\infty[$ B. $\mathbb{R}$ C. $]-2, 2[$ D. $[-2, 2]$

12. If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.

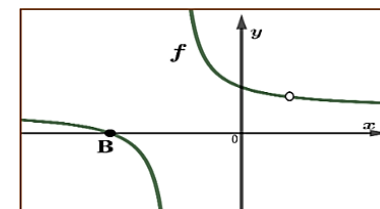
A. 10 B. 21 C. 31 D. 35

13. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
 C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$

14. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.

A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$



15. Find the value of $\int_1^3 \ln 9x dx$.

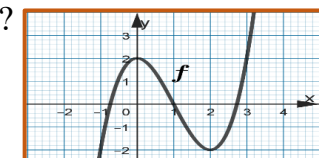
A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$

16. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x-1}$.

A. $y = -1$, $y = 2$ B. $y = -1$, $y = 0$ C. $y = 0$, $y = 2$ D. $y = 1$, $y = 0$

17. Use the given graph of the function $y = f(x)$. Which of the following is false?

A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$



18. Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$

19. Which of the following function is odd? A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
 C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$

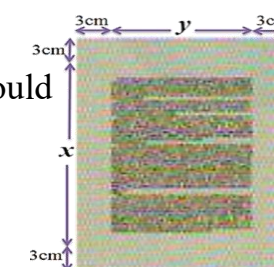
20. Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.

A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$

21. A graphic is designer is planning to design a rectangular page that should

contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?

A. $\begin{cases} \text{lenght} = 20\text{ cm} \\ \text{width} = 18\text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23\text{ cm} \\ \text{width} = 23\text{ cm} \end{cases}$
 C. $\begin{cases} \text{lenght} = 17\text{ cm} \\ \text{width} = 17\text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22\text{ cm} \\ \text{width} = 22\text{ cm} \end{cases}$



22. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0

23. Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.

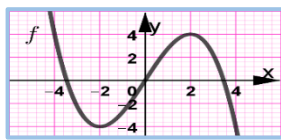
A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$

24. Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.

A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$

25. Use the given graph of the function f , find the value of x where $f'(x) = 0$.

- A. $x = -2$ B. $x = 2$
C. $x = 0$ D. both (A and B)



26. Find the point of inflection for $f(x) = x^3 + 3x^2$.

- A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$

27. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.

- A. 30 B. 10 C. $\frac{28}{3}$ D. 28

28. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.

- A. 1 B. 0 C. 2 D. $\frac{1}{2}$

29. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$

Knowing that $f'(5) = 4$ and $g(-2) = 5$.

- A. 3 B. $\frac{5}{12}$ C. 7 D. 5

30. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$.

- A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6

31. Find the value of a when $x = -1$ is being the vertical asymptote of

function $f(x) = \frac{3x-15}{x^2+3x+a}$.

- A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$

32. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.

- A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$

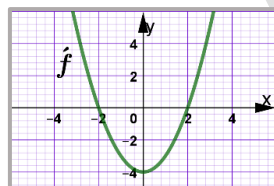
33. Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2?

- A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$

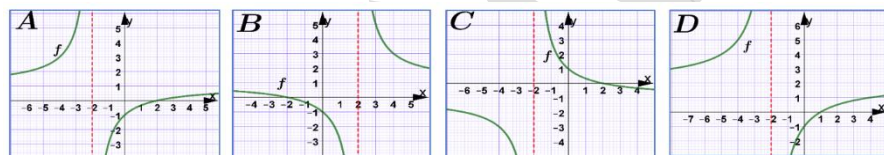
34. The graph on the right shows the graph of the function f' .

On which interval is the function f concave?

- A. $]-\infty, -2[$ B. $]2, +\infty[$
C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$



35. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$



36. Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$

- A. -2 B. 1 C. 4 D. -4

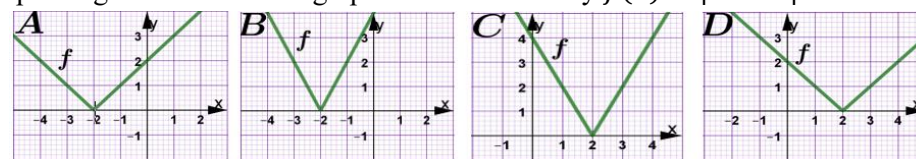
37. Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?

- A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $]-\infty, 0[$

38. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.

- A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$

39. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.



40. The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.

- A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

41. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.

- A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$

42. On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing?

- A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$

43. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.

- A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$

44. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.

- A. 12 m/s^2 B. 6 m/s^2 C. 18 m/s^2 D. 0 m/s^2

45. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

- A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

46. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:

- A. 1 B. -1 C. 2 D. -2

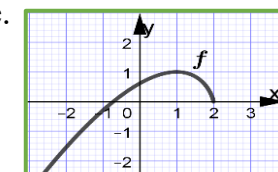
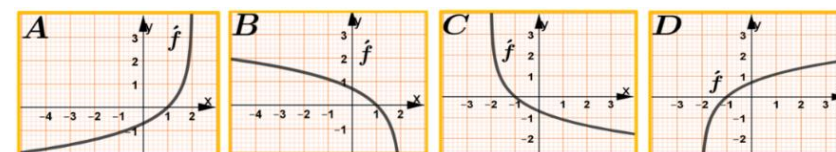
47. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.

- A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$

48. For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?

- A. 3 B. 4 C. 6 D. 12

49. The graph on the right shows the graph of f , determine the graph of its derivative.



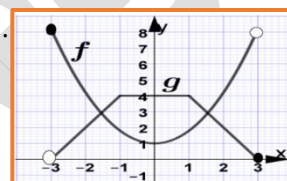
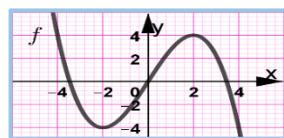
50. Find the value of $\int_1^2 \int_{x^2}^{\frac{3}{x^2}-2} dx$.

- A. $\frac{1}{2}$ B. $-\frac{21}{2}$ C. $-\frac{1}{2}$ D. $\frac{21}{2}$

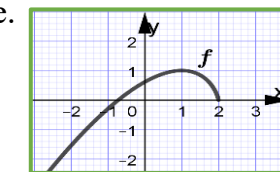
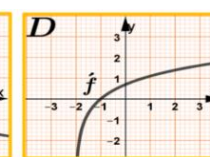
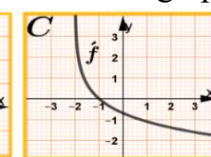
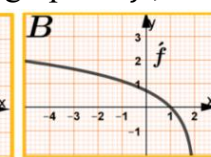
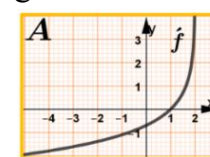


Choose the correct answer, two marks for each question

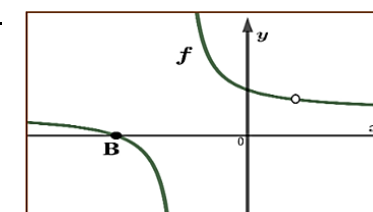
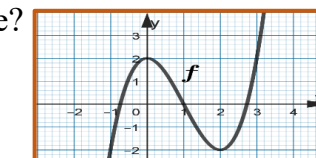
- Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$. A. 1 B. 0 C. 2 D. $\frac{1}{2}$
- Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
A. -2 B. 2 C. 5 D. 10
- Use the given graph of the function f , find the value of x where $f'(x) = 0$.
A. $x = -2$ B. $x = 2$
C. $x = 0$ D. both (A and B)
- Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.
A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$
- Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
A. -2 B. 1 C. 4 D. -4
- Which of the following function is odd?
A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$
- Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$
- If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0
- For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
A. 3 B. 4 C. 6 D. 12
- Use the given graph to find the value of b if you know that $f(g(b)) = 1$.
A. $b = 1$ B. $b = 0$
C. $b = 3$ D. $b = 4$
- Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
- What is the domain of the function $f(x) = \sqrt{4-x^2}$?
A. $]-\infty, -2] \cup [2, +\infty[$ B. $\mathbb{R}$ C. $]-2, 2[$ D. $[-2, 2]$
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$
- If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$ Knowing that $f'(5) = 4$ and $g(-2) = 5$.
A. 3 B. $\frac{5}{12}$ C. 7 D. 5



15. The graph on the right shows the graph of f , determine the graph of its derivative.



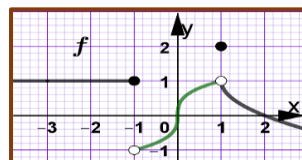
- Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6
- If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
- If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?
A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$
- Use the given graph of the function $y = f(x)$. Which of the following is false?
A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
C. $f''(2) < 0$ D. $f''(-1) < f''(3)$
- For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?
A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$
- Find the point of inflection for $f(x) = x^3 + 3x^2$.
A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$
- The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.
A. 10 B. $\frac{18}{\sqrt{10}}$
C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$
- Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^x+1}{e^x-1}$.
A. $y = -1, y = 2$ B. $y = -1, y = 0$ C. $y = 0, y = 2$ D. $y = 1, y = 0$
- Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$. A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$
- On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing?
A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$
- A man looks at a plane in the sky, at a horizontal distance of 600 m, with an inclination angle of 30° . What is the altitude of the plane?
A. $600\sqrt{3} m$ B. $200\sqrt{3} m$ C. 200 m D. $600\sqrt{2} m$



27. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.
- A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$

28. Use the given graph on the right, which of the following is false?

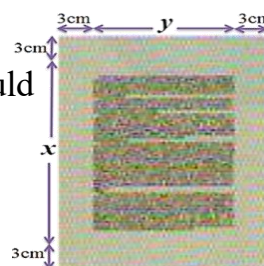
- A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$



29. A graphic is designer is planning to design a rectangular page that should

contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?

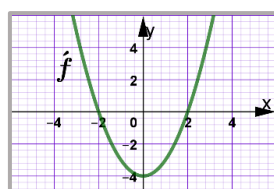
- A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
 C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$



30. The graph on the right shows the graph of the function f' .

On which interval is the function f concave?

- A. $]-\infty, -2[$ B. $]2, +\infty[$
 C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$

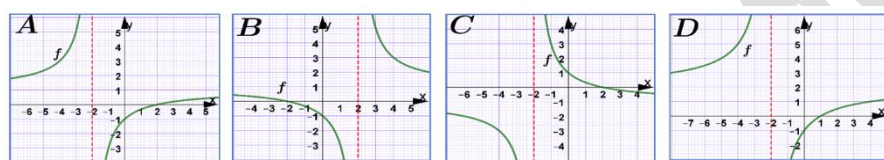


31. The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.

- A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

32. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine

the graph of the function $f(x) = \frac{x-2}{x+2}$



33. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.

- A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$

34. Find the value of $\int \frac{2-3\cos x}{4} dx$.
- A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
 C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

35. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.

- A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$

36. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:

- A. 1 B. -1 C. 2 D. -2

37. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.

- A. 30 B. 10 C. $\frac{28}{3}$ D. 28

38. Find the value of $\int_1^2 \int(\frac{3}{x^2} - 2) dx$.
- A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$

39. If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.

- A. 10 B. 21 C. 31 D. 35

40. Find the value of $\int_1^3 \ln 9x dx$.

- A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$

41. Find the value of a when $x = -1$ is being the vertical asymptote of

function $f(x) = \frac{3x-15}{x^2+3x+a}$.

A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$

42. Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.

- A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$

43. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$.
- A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0

44. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.

- A. 12 m/s^2 B. 6 m/s^2 C. 18 m/s^2 D. 0 m/s^2

45. Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?

- A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $]-\infty, 0]$

46. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$.
- A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$

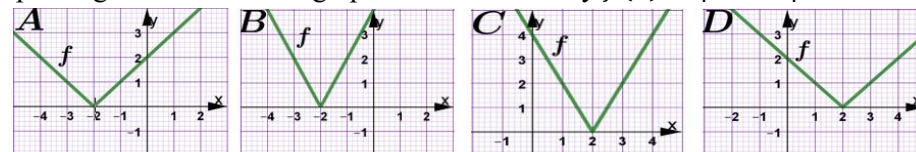
47. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

- A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
 C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$

48. Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.

- A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$

49. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.

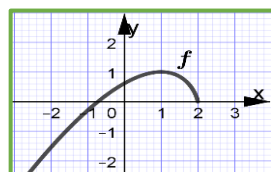
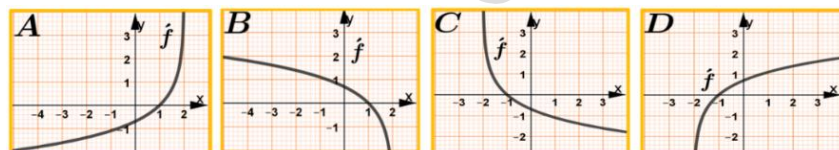
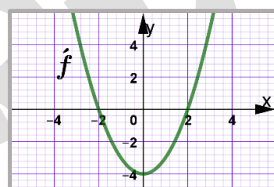
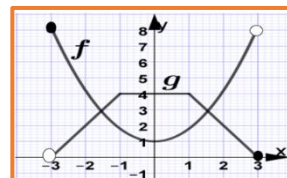


50. Use the intermediate vale theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2?
- A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$

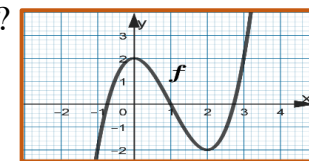


Choose the correct answer, two marks for each question

- Find the point of inflection for $f(x) = x^3 + 3x^2$.
 A. (2, -1) B. (-1, 2) C. (1, 4) D. (-1, 4)
- Find the equation of a line passing through the points (0, 2) and (-3, 0).
 A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
- Use the given graph to find the value of b if you know that $f(g(b)) = 1$.
 A. $b = 1$ B. $b = 0$
 C. $b = 3$ D. $b = 4$
- Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point (-1, 0).
 A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
- An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
 A. 12 m/s² B. 6 m/s² C. 18 m/s² D. 0 m/s²
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 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
- Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
 A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$
- Which of the following function is odd ?
 A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
 C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$
- The graph on the right shows the graph of the function f' .
 On which interval is the function f concave?
 A. $]-\infty, -2[$ B. $]2, +\infty[$
 C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$
- Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$.
 A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$.
 A. 1 B. 0 C. -1 D. $\frac{1}{2}$
- Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.
 A. 1 B. 0 C. 2 D. $\frac{1}{2}$
- The graph on the right shows the graph of f , determine the graph of its derivative.



14. Use the given graph of the function $y = f(x)$. Which of the following is false?

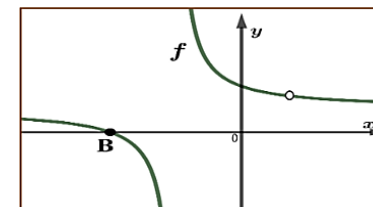


- A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$

15. Find the x-intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.

- A. (0, 2) B. (2, 0) C. (-2, 0) D. (0, 4)

16. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.



- A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$

17. If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.

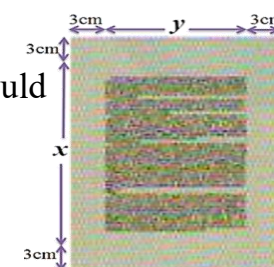
- A. 10 B. 21 C. 31 D. 35

18. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

- A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
 C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$

19. A graphic is designer is planning to design a rectangular page that should

contain 289 cm² of print. Each of the four margins is to be 3cm wide. What should the dimensions of the page be so that the least amount of paper is used?



- A. { length = 20 cm, width = 18 cm } B. { length = 23 cm, width = 23 cm }
 C. { length = 17 cm, width = 17 cm } D. { length = 22 cm, width = 22 cm }

20. The tangent line to the graph of a function h at the point (3, 6) passes through the point (-1, 4). Find the value of $h'(3)$.

- A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

21. On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing ?

- A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$

22. For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12

23. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x-1}$.

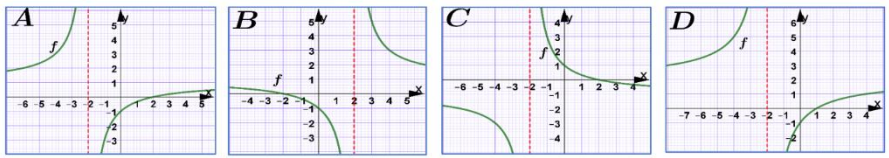
- A. $y = -1$, $y = 2$ B. $y = -1$, $y = 0$ C. $y = 0$, $y = 2$ D. $y = 1$, $y = 0$

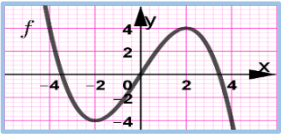
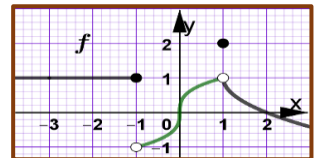
24. What is the domain of the function $f(x) = \sqrt{4-x^2}$?

- A. $]-\infty, -2] \cup [2, +\infty[$ B. R C. $]-2, 2[$ D. $[-2, 2]$

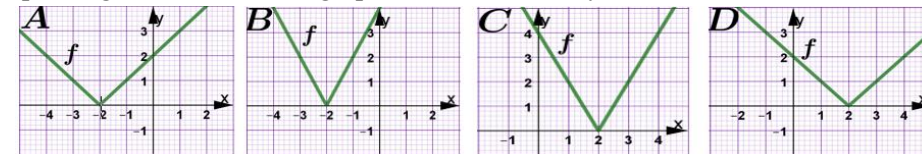
25. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$

- Knowing that $f'(5) = 4$ and $g(-2) = 5$.
 A. 3 B. $\frac{5}{12}$ C. 7 D. 5

26. Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
 A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0[$
27. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$. A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$
28. A man looks at a plane in the sky, at a horizontal distance of 600 m, with an inclination angle of 30° . What is the altitude of the plane?
 A. $600\sqrt{3}$ m B. $200\sqrt{3}$ m C. 200 m D. $600\sqrt{2}$ m
29. Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
 A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$
30. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0
31. Find the value of $\int_1^2 \left(\frac{3}{x^2} - 2\right) dx$. A. $\frac{1}{2}$ B. $-\frac{21}{2}$ C. $-\frac{1}{2}$ D. $\frac{21}{2}$
32. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?
 A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
 C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$
33. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$.

34. Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
35. Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$
36. Find the value of $\int \frac{2-3\cos x}{4} dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
 C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$
37. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?
 A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x+2}$
38. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
 A. 30 B. 10 C. $\frac{28}{3}$ D. 28
39. Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$. A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$

40. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$
41. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:
 A. 1 B. -1 C. 2 D. -2
42. Find the value of $\int_1^3 \ln 9x dx$.
 A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$
43. Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
 A. -2 B. 2 C. 5 D. 10
44. Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
 A. -2 B. 1 C. 4 D. -4
45. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0
46. Use the given graph of the function f , find the value of x where $f'(x) = 0$.
 A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)

47. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
 A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
48. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.
 A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$
49. Use the given graph on the right, which of the following is false?
 A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$


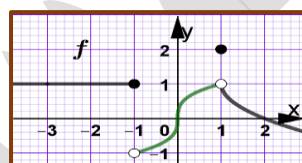
50. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.



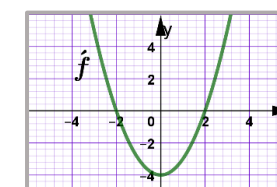
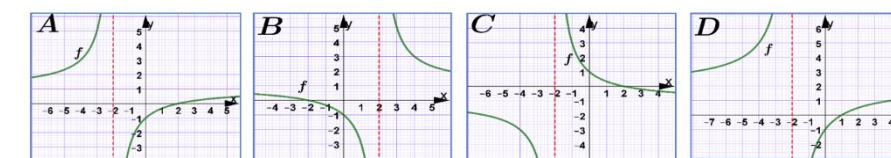
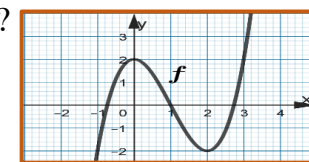


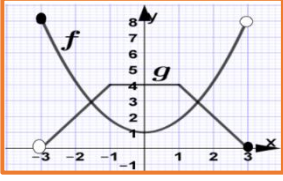
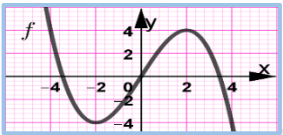
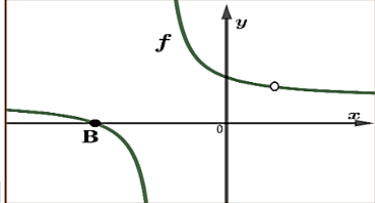
Choose the correct answer, two marks for each question

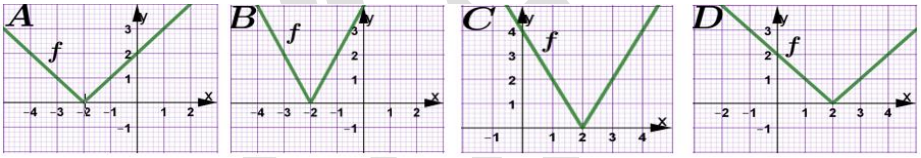
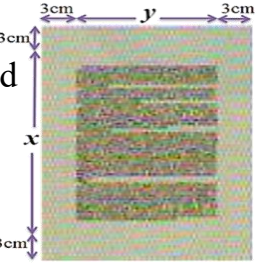
- Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
- Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
 A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0[$
- Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.
 A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
- If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?
 A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
 C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$
- Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.
 A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$
- Find the value of $\int_1^3 \ln 9x \, dx$.
 A. $\ln 9x - 2$ B. $9 \ln 3x - 2$ C. $7 \ln 3x + 2$ D. $7 \ln 3x - 2$
- Find the value of $\int_1^2 \int (\frac{3}{x^2} - 2) \, dx$. A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$
- What is the domain of the function $f(x) = \sqrt{4 - x^2}$?
 A. $] -\infty, -2] \cup [2, +\infty[$ B. R C. $] -2, 2[$ D. $[-2, 2]$
- Use the given graph on the right, which of the following is false?
 A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$
- If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$ knowing that $f'(5) = 4$ and $g(-2) = 5$.
 A. 3 B. $\frac{5}{12}$ C. 7 D. 5
- If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
 A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
- The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.
 A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2



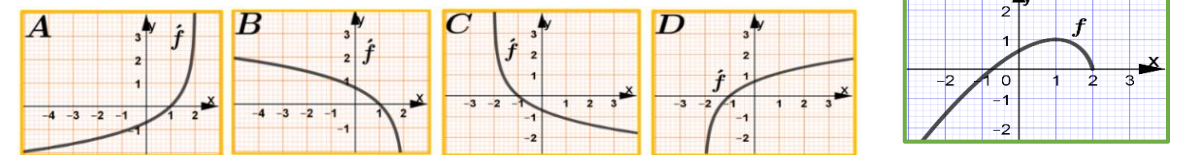
- Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
 A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$
- Use the given graph of the function $y = f(x)$. Which of the following is false?
 A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$
- Determine the two functions of the following that match at all value of x with the exception of $x = 1$.
 A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
 C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$
- An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
 A. $12 \, m/s^2$ B. $6 \, m/s^2$ C. $18 \, m/s^2$ D. $0 \, m/s^2$
- Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$.
 A. B. C. D.
- For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?
 A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$
- Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$
- On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing?
 A. $] -\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$
- Which of the following function is odd?
 A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
 C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$
- The graph on the right shows the graph of the function f' . On which interval is the function f concave?
 A. $] -\infty, -2[$ B. $]2, +\infty[$
 C. $] -\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$
- Find the value of $\int \frac{2-3\cos x}{4} \, dx$.
 A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
 C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$
- Find the point of inflection for $f(x) = x^3 + 3x^2$.
 A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$
- Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.
 A. 1 B. 0 C. 2 D. $\frac{1}{2}$



26. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^x+1}{e^x-1}$.
- A. $y = -1, y = 2$ B. $y = -1, y = 0$ C. $y = 0, y = 2$ D. $y = 1, y = 0$
27. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0
28. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
- A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$
29. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.
- A. $b = 1$ B. $b = 0$
C. $b = 3$ D. $b = 4$
- 
30. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$
31. A man looks at a plane in the sky, at a horizontal distance of 600 m, with an inclination angle of 30° . What is the altitude of the plane?
- A. $600\sqrt{3}$ m B. $200\sqrt{3}$ m C. 200 m D. $600\sqrt{2}$ m
32. Use the given graph of the function f , find the value of x where $f'(x) = 0$.
- A. $x = -2$ B. $x = 2$
C. $x = 0$ D. both (A and B)
- 
33. For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
- A. 3 B. 4 C. 6 D. 12
34. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.
- A. 10 B. $\frac{18}{\sqrt{10}}$
C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$
- 
35. Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$
36. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$. A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$
37. Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2? A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
38. Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$. A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$
39. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
- A. 30 B. 10 C. $\frac{28}{3}$ D. 28
40. Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
- A. -2 B. 1 C. 4 D. -4

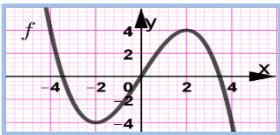
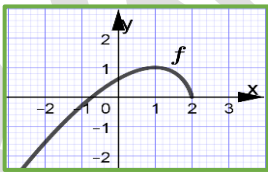
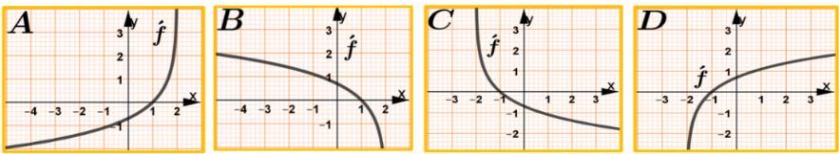
41. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.
- A. (0, 2) B. (2, 0) C. (-2, 0) D. (0, 4)
42. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.
- A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
43. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.
- 
44. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0
45. If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.
- A. 10 B. 21 C. 31 D. 35
46. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:
- A. 1 B. -1 C. 2 D. -2
47. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6
48. Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
- A. -2 B. 2 C. 5 D. 10
49. A graphic is designer is planning to design a rectangular page that should contain 289 cm^2 of print. Each of the four margins is to be 3cm wide. What should the dimensions of the page be so that the least amount of paper is used?
- 
- A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$

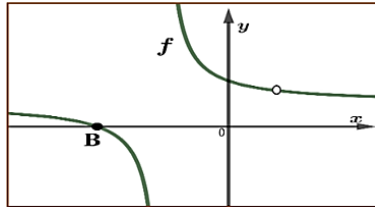
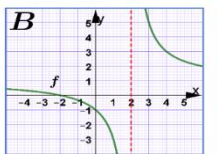
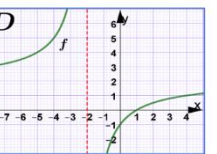
50. The graph on the right shows the graph of f , determine the graph of its derivative.





Choose the correct answer, two marks for each question

- Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6
 - Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.
A. (0, 2) B. (2, 0) C. (-2, 0) D. (0, 4)
 - Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.
A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$
 - A man looks at a plane in the sky, at a horizontal distance of 600 m, with an inclination angle of 30° . What is the altitude of the plane?
A. $600\sqrt{3}$ m B. $200\sqrt{3}$ m C. 200 m D. $600\sqrt{2}$ m
 - Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
A. -2 B. 1 C. 4 D. -4
 - Use the given graph of the function f , find the value of x where $f'(x) = 0$.
A. $x = -2$ B. $x = 2$
C. $x = 0$ D. both (A and B)
- 
- The graph on the right shows the graph of f , determine the graph of its derivative.


 - Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x - 1}$.
A. $y = -1, y = 2$ B. $y = -1, y = 0$ C. $y = 0, y = 2$ D. $y = 1, y = 0$
 - Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0]$
 - For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?
 A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$
 - Find the equation of a line passing through the points (0, 2) and (-3, 0).
A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
 - Find b so that the points (3, 5), (b, 0) and (-4, 10) are collinear.
A. -2 B. 2 C. 5 D. 10
 - Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$.
A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$

- Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
 A. $\left\{ \begin{pmatrix} -3 \\ 4 \end{pmatrix} \right\}$ B. $\left\{ \begin{pmatrix} 4 \\ -3 \end{pmatrix} \right\}$ C. $\left\{ \begin{pmatrix} -4 \\ 3 \end{pmatrix} \right\}$ D. $\left\{ \begin{pmatrix} 4 \\ 3 \end{pmatrix} \right\}$
 - Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point (-1, 0).
A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
 - Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$
 - The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.
 A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$
- 
- Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2?
 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
 - If $f(x) = x\sqrt{x}$, find the value of $f'(1)$.
A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$
 - Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.
A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$
 - Find the point of inflection for $f(x) = x^3 + 3x^2$.
A. (2, -1) B. (-1, 2) C. (1, 4) D. (-1, 4)
 - Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.
A. 1 B. 0 C. 2 D. $\frac{1}{2}$
 - Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$.
A. 1 B. 0 C. -1 D. $\frac{1}{2}$
 - Find the value of $\int_1^3 \ln 9x \, dx$.
A. $\ln 9x - 2$ B. $9 \ln 3x - 2$ C. $7 \ln 3x + 2$ D. $7 \ln 3x - 2$
 - Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$
 - An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
A. 12 m/s² B. 6 m/s² C. 18 m/s² D. 0 m/s²
 - Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$.
 A. 
 B. 
 C. 
 D. 

28. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

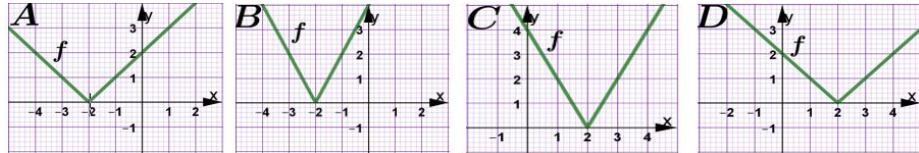
A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$

B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$

C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$

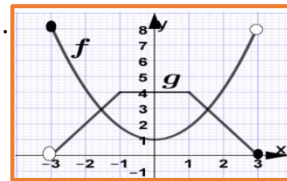
D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$

29. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.



30. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.

- A. $b = 1$ B. $b = 0$
C. $b = 3$ D. $b = 4$



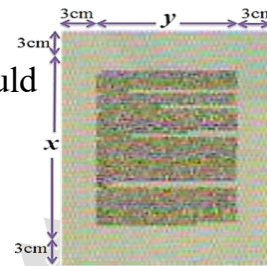
31. On which interval is the function $f(x) = e^{(x^3 - 3x^2)}$ decreasing?

- A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$

32. A graphic is designer is planning to design a rectangular page that should

contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?

- A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$



33. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:

- A. 1 B. -1 C. 2 D. -2

34. If $\int_{-1}^1 f(x) dx = 5$ and $\int_{-1}^1 h(x) dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)] dx$.

- A. 10 B. 21 C. 31 D. 35

35. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$.

- A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0

36. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

- A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$

37. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.

- A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$

38. Find the value of $\int \frac{2-3\cos x}{4} dx$.

- A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

39. Which of the following function is odd?

- A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$

40. The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.

- A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

41. For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?

- A. 3 B. 4 C. 6 D. 12

42. Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$.

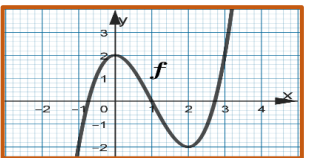
- A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$

43. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.

- A. 30 B. 10 C. $\frac{28}{3}$ D. 28

44. Use the given graph of the function $y = f(x)$. Which of the following is false?

- A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
C. $f''(2) < 0$ D. $f''(-1) < f''(3)$

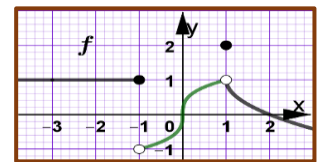


45. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$.

- A. $-\infty$ B. $+\infty$ C. -1 D. 0

46. Use the given graph on the right, which of the following is false?

- A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$



47. Find the value of $\int_1^2 \int (\frac{3}{x^2} - 2) dx$.

- A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$

48. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$.

Knowing that $f'(5) = 4$ and $g(-2) = 5$.

- A. 3 B. $\frac{5}{12}$ C. 7 D. 5

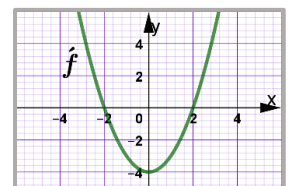
49. What is the domain of the function $f(x) = \sqrt{4-x^2}$?

- A. $]-\infty, -2] \cup [2, +\infty[$ B. R C. $]-2, 2[$ D. $[-2, 2]$

50. The graph on the right shows the graph of the function f' .

On which interval is the function f concave?

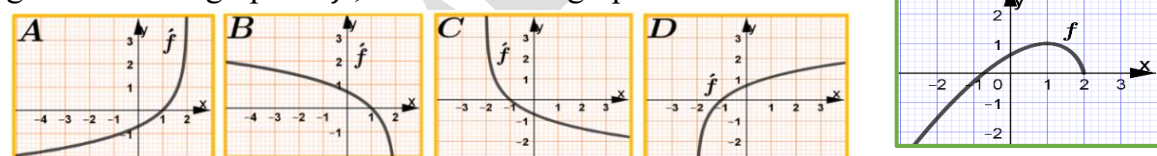
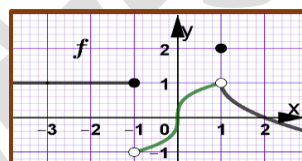
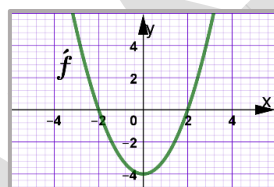
- A. $]-\infty, -2[$ B. $]2, +\infty[$
C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$





Choose the correct answer, two marks for each question

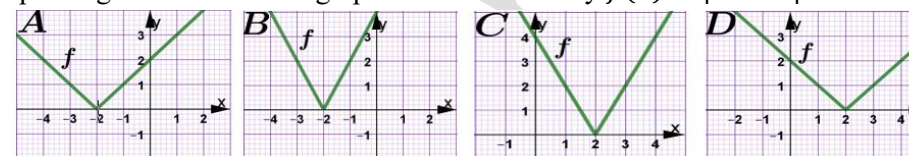
- Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
 A. -2 B. 2 C. 5 D. 10
- Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
 A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$
- On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing?
 A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$
- Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$.
 A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$
- If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
 A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
- Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$
- Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.
 A. 1 B. 0 C. 2 D. $\frac{1}{2}$
- Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$.
 A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
- The graph on the right shows the graph of the function f' .
 On which interval is the function f concave?
 A. $]-\infty, -2[$ B. $]2, +\infty[$
 C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$
- Use the given graph on the right, which of the following is false?
 A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$
- If $f(x) = x\sqrt{x}$, find the value of $f'(1)$.
 A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$
- The graph on the right shows the graph of f , determine the graph of its derivative.



- Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
 C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$

- Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.



- Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.
 A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$
- A man looks at a plane in the sky, at a horizontal distance of 600 m, with an inclination angle of 30° . What is the altitude of the plane?
 A. $600\sqrt{3}$ m B. $200\sqrt{3}$ m C. 200 m D. $600\sqrt{2}$ m
- Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x-1}$.
 A. $y = -1$, $y = 2$ B. $y = -1$, $y = 0$ C. $y = 0$, $y = 2$ D. $y = 1$, $y = 0$
- If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

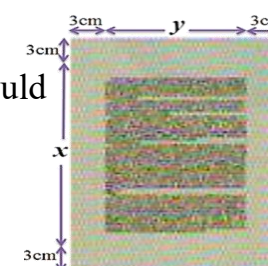
A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
 C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$

- If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.
 A. 10 B. 21 C. 31 D. 35
- Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
 A. 30 B. 10 C. $\frac{28}{3}$ D. 28
- For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12
- If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$.
 Knowing that $f'(5) = 4$ and $g(-2) = 5$.
 A. 3 B. $\frac{5}{12}$ C. 7 D. 5
- If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:
 A. 1 B. -1 C. 2 D. -2

- A graphic is designer is planning to design a rectangular page that should

contain 289 cm^2 of print. Each of the four margins is to be 3cm wide. What should the dimensions of the page be so that the least amount of paper is used?

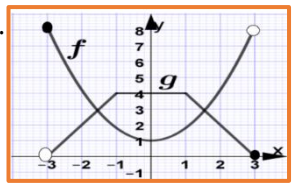
A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
 C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$



25. Find the value of $\int_1^2 \int(\frac{3}{x^2} - 2) dx$. A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$
26. Find the point of inflection for $f(x) = x^3 + 3x^2$.
A. (2, -1) B. (-1, 2) C. (1, 4) D. (-1, 4)
27. Find the equation of a line passing through the points (0, 2) and (-3, 0).
A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
28. Use the given graph of the function f , find the value of x where $f'(x) = 0$.
A. $x = -2$ B. $x = 2$
C. $x = 0$ D. both (A and B)
-
29. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$
-
30. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0
31. Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2 ?
A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
32. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.
A. 10 B. $\frac{18}{\sqrt{10}}$
C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$
-
33. Find the x-intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.
A. (0, 2) B. (2, 0) C. (-2, 0) D. (0, 4)
34. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?
A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$
35. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
A. 12 m/s² B. 6 m/s² C. 18 m/s² D. 0 m/s²
36. The tangent line to the graph of a function h at the point (3, 6) passes through the point (-1, 4). Find the value of $h'(3)$.
A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2
37. Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
A. -2 B. 1 C. 4 D. -4

38. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.

- A. $b = 1$ B. $b = 0$
C. $b = 3$ D. $b = 4$

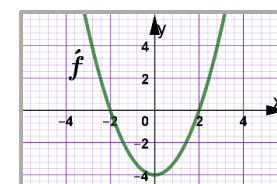
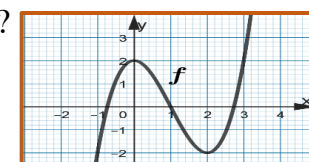
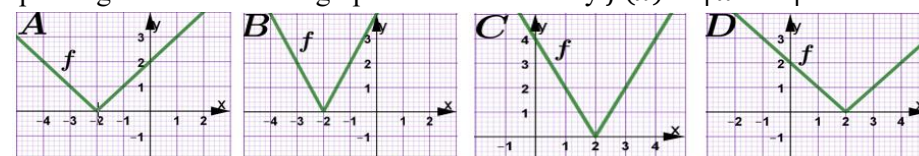
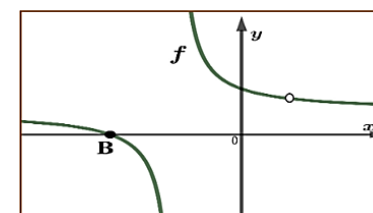
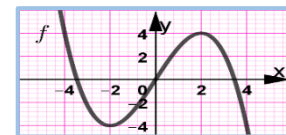
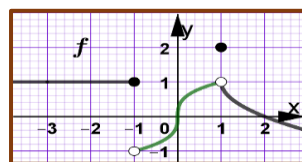


39. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point (-1, 0).
A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
40. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $\frac{-1}{6}$ C. $\frac{1}{6}$ D. 6
41. Find the value of $\int_1^3 \ln 9x dx$.
A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$
42. Which of the following function is odd ?
A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$
43. Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0]$
44. What is the domain of the function $f(x) = \sqrt{4-x^2}$?
A. $] -\infty, -2] \cup [2, +\infty[$ B. R C. $] -2, 2[$ D. $[-2, 2]$
45. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0
46. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x-axis and the two lines $x = 0$ and $x = 2$.
A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$
47. Find the value of $\int \frac{2-3\cos x}{4} dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$
48. Use the given graph of the function $y = f(x)$. Which of the following is false?
A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
C. $f''(2) < 0$ D. $f''(-1) < f''(3)$
-
49. Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
A. $\left\{ \begin{pmatrix} -3 \\ 4 \end{pmatrix} \right.$ B. $\left\{ \begin{pmatrix} 4 \\ -3 \end{pmatrix} \right.$ C. $\left\{ \begin{pmatrix} -4 \\ 3 \end{pmatrix} \right.$ D. $\left\{ \begin{pmatrix} 4 \\ 3 \end{pmatrix} \right.$
 $\left\{ \begin{pmatrix} 3 \\ -4 \end{pmatrix} \right.$ $\left\{ \begin{pmatrix} -4 \\ -3 \end{pmatrix} \right.$ $\left\{ \begin{pmatrix} 4 \\ -3 \end{pmatrix} \right.$ $\left\{ \begin{pmatrix} -4 \\ 3 \end{pmatrix} \right.$
50. Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$



Choose the correct answer, two marks for each question

- If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
 A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
- Use the given graph on the right, which of the following is false?
 A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$
- Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.
 A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$
- Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2?
 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
- Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$.
 A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
- Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$.
 A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6
- Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
 A. $\{(-3, 4)\}$ B. $\{(4, -3)\}$ C. $\{(-4, 3)\}$ D. $\{(4, 3)\}$
- Find the value of $\int_1^3 \ln 9x \, dx$.
 A. $\ln 9x - 2$ B. $9 \ln 3x - 2$ C. $7 \ln 3x + 2$ D. $7 \ln 3x - 2$
- Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x - 1}$.
 A. $y = -1, y = 2$ B. $y = -1, y = 0$ C. $y = 0, y = 2$ D. $y = 1, y = 0$
- Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$.
 A. -2 B. 1 C. 4 D. -4
- What is the domain of the function $f(x) = \sqrt{4 - x^2}$?
 A. $]-\infty, -2] \cup [2, +\infty[$ B. $\mathbb{R}$ C. $]-2, 2[$ D. $[-2, 2]$
- For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12
- If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$.
 A. $-\infty$ B. $+\infty$ C. -1 D. 0
- Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$



- Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.
 A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
- The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.
 A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2
- Use the given graph of the function f , find the value of x where $f'(x) = 0$.
 A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)
- Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
 A. 30 B. 10 C. $\frac{28}{3}$ D. 28
- The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.
 A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$
- Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
 A. -2 B. 2 C. 5 D. 10
- If $f(x) = x\sqrt{x}$, find the value of $f'(1)$.
 A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$
- Find the value of $\int_1^2 \int (\frac{3}{x^2} - 2) \, dx$.
 A. $\frac{1}{2}$ B. $-\frac{21}{2}$ C. $-\frac{1}{2}$ D. $\frac{21}{2}$
- Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.
 A. B. C. D.
- Use the given graph of the function $y = f(x)$. Which of the following is false?
 A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$
- Find the x -intercepts of the graph of the function $f(x) = (x + 2)\sqrt{4 + x^2}$.
 A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$
- If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$ knowing that $f'(5) = 4$ and $g(-2) = 5$.
 A. 3 B. $\frac{5}{12}$ C. 7 D. 5
- The graph on the right shows the graph of the function f' . On which interval is the function f concave?
 A. $]-\infty, -2[$ B. $]2, +\infty[$
 C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$

28. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$
C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$

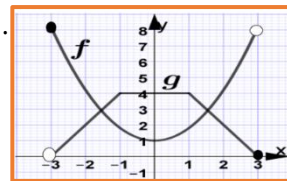
B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

29. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.

A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$

30. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.

A. $b = 1$ B. $b = 0$
C. $b = 3$ D. $b = 4$



31. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.

A. 1 B. 0 C. 2 D. $\frac{1}{2}$

32. A man looks at a plane in the sky, at a horizontal distance of 600 m , with an inclination angle of 30° . What is the altitude of the plane?

A. $600\sqrt{3}\text{ m}$ B. $200\sqrt{3}\text{ m}$ C. 200 m D. $600\sqrt{2}\text{ m}$

33. If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.

A. 10 B. 21 C. 31 D. 35

34. Which of the following function is odd ?

A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$

35. Find the point of inflection for $f(x) = x^3 + 3x^2$.

A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$

36. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.

A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$

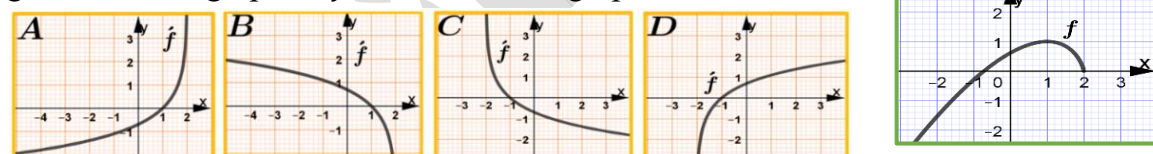
37. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$

38. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:

A. 1 B. -1 C. 2 D. -2

39. The graph on the right shows the graph of f , determine the graph of its derivative.



40. Find the value of a when $x = -1$ is being the vertical asymptote of

function $f(x) = \frac{3x-15}{x^2+3x+a}$. A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$

41. Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$.

A. 1 B. 0 C. -1 D. $\frac{1}{2}$

42. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$.

A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0

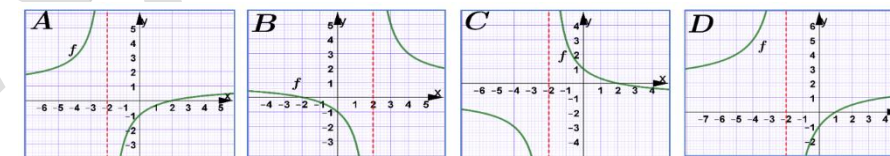
43. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.

A. 12 m/s^2 B. 6 m/s^2 C. 18 m/s^2 D. 0 m/s^2

44. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.

A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$

45. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$.



46. Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?

A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0]$

47. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$

48. Find the value of $\int \frac{2-3\cos x}{4} dx$.

A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

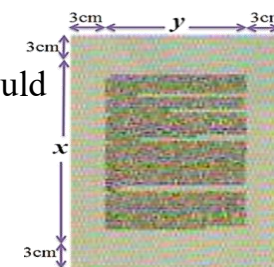
49. On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing ?

A. $] -\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$

50. A graphic is designer is planning to design a rectangular page that should

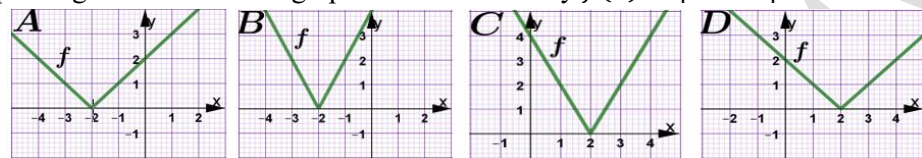
contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?

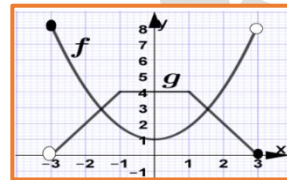
A. $\begin{cases} \text{lenght} = 20\text{ cm} \\ \text{width} = 18\text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23\text{ cm} \\ \text{width} = 23\text{ cm} \end{cases}$
C. $\begin{cases} \text{lenght} = 17\text{ cm} \\ \text{width} = 17\text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22\text{ cm} \\ \text{width} = 22\text{ cm} \end{cases}$



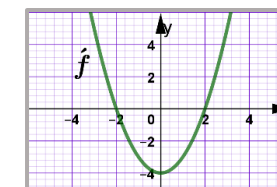


Choose the correct answer, two marks for each question

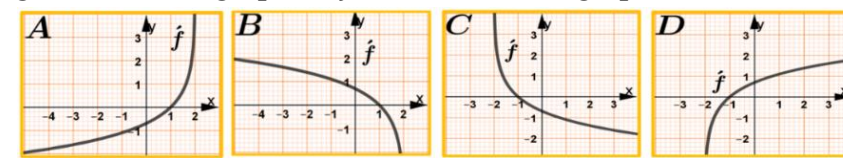
- If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
 A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
- Which of the following function is odd ?
 A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
 C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$
- For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?
 A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$
- Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.
 A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
- Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
 A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$
- Use the given graph to find the value of b if you know that $f(g(b)) = 1$.
 A. $b = 1$ B. $b = 0$
 C. $b = 3$ D. $b = 4$
- Find the value of $\int_1^3 \ln 9x \, dx$.
 A. $\ln 9x - 2$ B. $9 \ln 3x - 2$ C. $7 \ln 3x + 2$ D. $7 \ln 3x - 2$
- Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.

- Determine the two functions of the following that match at all value of x with the exception of $x = 1$.
 A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
 C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$
- A man looks at a plane in the sky, at a horizontal distance of 600 m, with an inclination angle of 30° . What is the altitude of the plane?
 A. $600\sqrt{3} \, m$ B. $200\sqrt{3} \, m$ C. $200 \, m$ D. $600\sqrt{2} \, m$
- Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
 A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0[$

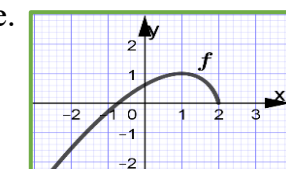
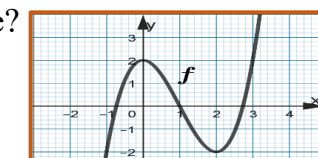
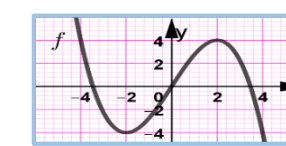


12. The graph on the right shows the graph of the function f' .



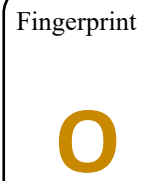
On which interval is the function f concave?

- A. $]-\infty, -2[$ B. $]2, +\infty[$
 C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$
- Find the value of $\int_1^2 \int (\frac{3}{x^2} - 2) \, dx$.
 A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$
 - For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12
 - Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2 ?
 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
 - Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.
 A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
 - Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$
 - Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$.
 A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0
 - Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$.
 A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
 - Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.
 A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$
 - If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is :
 A. 1 B. -1 C. 2 D. -2
 - Use the given graph of the function f , find the value of x where $f'(x) = 0$.
 A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)
 - Use the given graph of the function $y = f(x)$. Which of the following is false?
 A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$
 - The graph on the right shows the graph of f , determine the graph of its derivative.

 - If $\int_{-1}^1 f(x) \, dx = 5$ and $\int_{-1}^1 h(x) \, dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)] \, dx$.
 A. 10 B. 21 C. 31 D. 35
 - Find the value for the multiplication of $f''(2) g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
 A. -2 B. 1 C. 4 D. -4

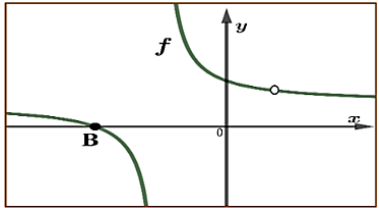
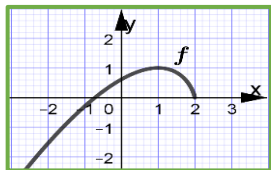
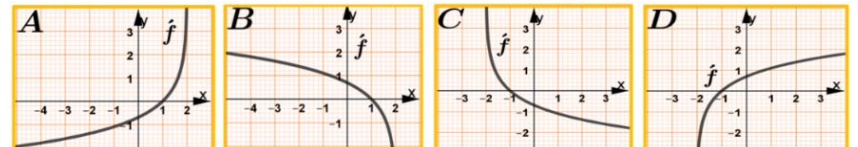


27. Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$.
A. $a = -1$ **B.** $a = 2$ **C.** $a = -2$ **D.** $a = 1$
28. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.
A. 1 **B.** 0 **C.** 2 **D.** $\frac{1}{2}$
29. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
A. 12 m/s^2 **B.** 6 m/s^2 **C.** 18 m/s^2 **D.** 0 m/s^2
30. Find the point of inflection for $f(x) = x^3 + 3x^2$.
A. (2, -1) **B.** (-1, 2) **C.** (1, 4) **D.** (-1, 4)
31. Use the given graph on the right, which of the following is false?
A. $\lim_{x \rightarrow 1^-} f(x) = 1$ **B.** $\lim_{x \rightarrow 2^-} f(x) = 0$
C. $\lim_{x \rightarrow -1^+} f(x) = -1$ **D.** $\lim_{x \rightarrow 1^+} f(x) = f(1)$
-
32. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
A. 30 **B.** 10 **C.** $\frac{28}{3}$ **D.** 28
33. Find the value of $\int \frac{2-3\cos x}{4} dx$.
A. $\frac{1}{4}(2x - 3\sin x) + c$ **B.** $\frac{1}{4}(2 - 3\sin x) + c$
C. $2x + 3\sin x + c$ **D.** $2x - 3\sin x + c$
34. The tangent line to the graph of a function h at the point (3, 6) passes through the point (-1, 4). Find the value of $h'(3)$.
A. 2 **B.** $\frac{1}{2}$ **C.** $-\frac{1}{2}$ **D.** -2
35. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?
A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ **B.** $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ **D.** $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$
36. On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing?
A. $]-\infty, 0[$ **B.** $]2, +\infty[$ **C.** $]0, 4[$ **D.** $]0, 2[$
37. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$.
-
38. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$ knowing that $f'(5) = 4$ and $g(-2) = 5$.
A. 3 **B.** $\frac{5}{12}$ **C.** 7 **D.** 5
39. Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$.
A. 1 **B.** 0 **C.** -1 **D.** $\frac{1}{2}$
40. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$.
A. 0 **B.** $\frac{-1}{6}$ **C.** $\frac{1}{6}$ **D.** 6

41. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
A. $y = x + 2$ **B.** $y = -x + 2$ **C.** $y = x - 2$ **D.** $y = -x - 2$
42. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^x+1}{e^x-1}$.
A. $y = -1, y = 2$ **B.** $y = -1, y = 0$ **C.** $y = 0, y = 2$ **D.** $y = 1, y = 0$
43. A graphic designer is planning to design a rectangular page that should contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?
-
- A.** $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ **B.** $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ **D.** $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$
44. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$.
A. $\frac{1}{3}$ **B.** 2 **C.** $\frac{3}{2}$ **D.** $\frac{2}{3}$
45. Find b so that the points (3, 5), (b, 0) and (-4, 10) are collinear.
A. -2 **B.** 2 **C.** 5 **D.** 10
46. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.
A. 2 **B.** 3 **C.** $\frac{1}{2}$ **D.** $\frac{1}{6}$
47. What is the domain of the function $f(x) = \sqrt{4-x^2}$?
A. $]-\infty, -2] \cup [2, +\infty[$ **B.** R **C.** $]-2, 2[$ **D.** $[-2, 2]$
48. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.
A. (0, 2) **B.** (2, 0) **C.** (-2, 0) **D.** (0, 4)
49. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.
A. 10 **B.** $\frac{18}{\sqrt{10}}$
C. $\sqrt{10}$ **D.** $\frac{4}{\sqrt{10}}$
-
50. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$.
A. $-\infty$ **B.** $+\infty$ **C.** -1 **D.** 0

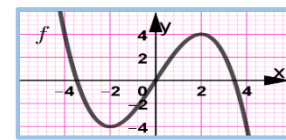


Choose the correct answer, two marks for each question

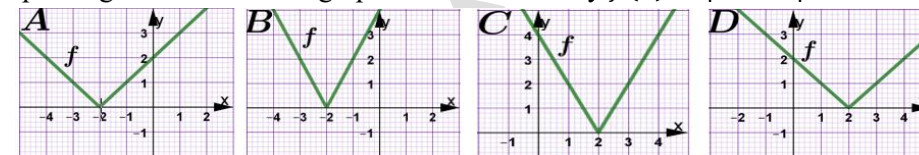
- The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point **B** and the line $x - 3y = -14$.
 A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$

- Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.
 A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
- Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
 A. $\left\{ \begin{pmatrix} -3 \\ 4 \end{pmatrix} \right\}$ B. $\left\{ \begin{pmatrix} 4 \\ -3 \end{pmatrix} \right\}$ C. $\left\{ \begin{pmatrix} -4 \\ 3 \end{pmatrix} \right\}$ D. $\left\{ \begin{pmatrix} 4 \\ 3 \end{pmatrix} \right\}$
- The graph on the right shows the graph of f , determine the graph of its derivative.


- If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:
 A. 1 B. -1 C. 2 D. -2
- Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2 ?
 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
- Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.
 A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$
- Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.
 A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$
- Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$.
 A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
- Determine the two functions of the following that match at all value of x with the exception of $x = 1$.
 A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
 C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$
- An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
 A. 12 m/s² B. 6 m/s² C. 18 m/s² D. 0 m/s²

12. Use the given graph of the function f , find the value of x where $f'(x) = 0$.

A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)



13. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.



14. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
 C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$

15. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$

16. Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.

A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$

17. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

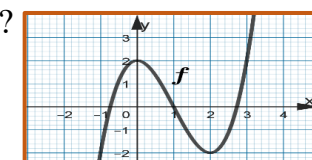
18. Find the value of $\int \frac{2-3\cos x}{4} dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
 C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

19. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.

A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$

20. Use the given graph of the function $y = f(x)$. Which of the following is false?

A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$



21. The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.

A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

22. Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.

A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$

23. Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$

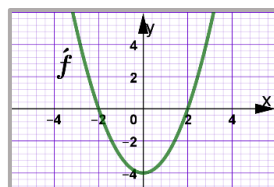
24. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.

A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$

25. The graph on the right shows the graph of the function f' .

On which interval is the function f concave?

- A. $]-\infty, -2[$ B. $]2, +\infty[$
C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$



26. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0

27. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^x + 1}{e^x - 1}$.

- A. $y = -1, y = 2$ B. $y = -1, y = 0$ C. $y = 0, y = 2$ D. $y = 1, y = 0$

28. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.

- A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$

29. A man looks at a plane in the sky, at a horizontal distance of 600 m , with an inclination angle of 30° . What is the altitude of the plane?

- A. $600\sqrt{3}\text{ m}$ B. $200\sqrt{3}\text{ m}$ C. 200 m D. $600\sqrt{2}\text{ m}$

30. Find the value of $\int_1^2 \int (\frac{3}{x^2} - 2) dx$. A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$

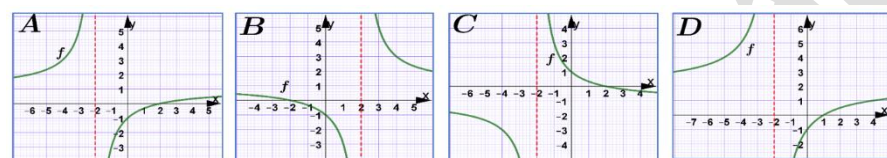
31. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.

- A. 30 B. 10 C. $\frac{28}{3}$ D. 28

32. Which of the following function is odd? A. $f(x) = \frac{x}{|x-1| - |x+1|}$ B. $f(x) = x^2 + \sin x$
C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$

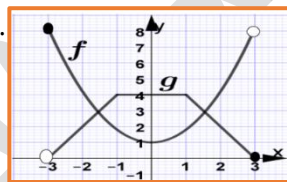
33. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine

the graph of the function $f(x) = \frac{x-2}{x+2}$



34. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.

- A. $b = 1$ B. $b = 0$
C. $b = 3$ D. $b = 4$



35. Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.

- A. -2 B. 2 C. 5 D. 10

36. On which interval is the function $f(x) = e^{(x^3 - 3x^2)}$ decreasing?

- A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$

37. What is the domain of the function $f(x) = \sqrt{4 - x^2}$?

- A. $]-\infty, -2[\cup]2, +\infty[$ B. $\mathbb{R}$ C. $]-2, 2[$ D. $[-2, 2]$

38. Find the value of $\int_1^3 \ln 9x dx$.

- A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$

39. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$

- Knowing that $f'(5) = 4$ and $g(-2) = 5$. A. 3 B. $\frac{5}{12}$ C. 7 D. 5

40. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$. A. 1 B. 0 C. 2 D. $\frac{1}{2}$

41. Find the point of inflection for $f(x) = x^3 + 3x^2$.

- A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$

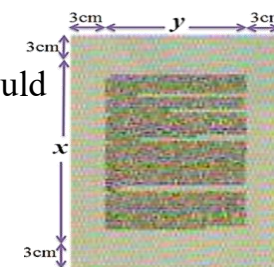
42. For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2 - 3x - 9}{x-3} & x \neq 3 \\ bx - 3 & x = 3 \end{cases}$ have no points of discontinuity?

- A. 3 B. 4 C. 6 D. 12

43. A graphic is designer is planning to design a rectangular page that should

contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?

- A. $\begin{cases} \text{lenght} = 20\text{ cm} \\ \text{width} = 18\text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23\text{ cm} \\ \text{width} = 23\text{ cm} \end{cases}$
C. $\begin{cases} \text{lenght} = 17\text{ cm} \\ \text{width} = 17\text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22\text{ cm} \\ \text{width} = 22\text{ cm} \end{cases}$

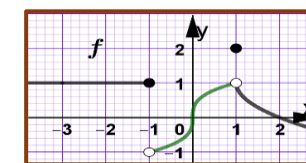


44. Find the value of a when $x = -1$ is being the vertical asymptote of

function $f(x) = \frac{3x-15}{x^2+3x+a}$. A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$

45. Use the given graph on the right, which of the following is false?

- A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$



46. If $\int_{-1}^1 f(x) dx = 5$ and $\int_{-1}^1 h(x) dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)] dx$.

- A. 10 B. 21 C. 31 D. 35

47. Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?

- A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $]-\infty, 0]$

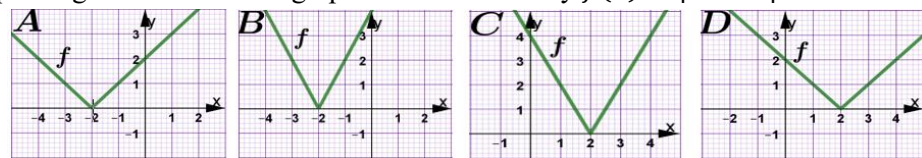
48. Find the value for the multiplication of $f''(2) g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$

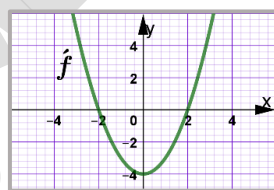
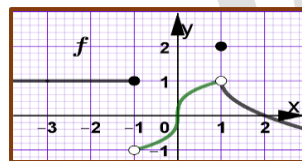
- A. -2 B. 1 C. 4 D. -4

49. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0

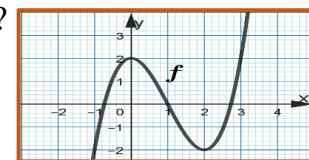
50. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6} - 3}{x-3}$. A. 0 B. $\frac{-1}{6}$ C. $\frac{1}{6}$ D. 6

Choose the correct answer, two marks for each question

- On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing ?
 A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$
- Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
 A. $\left\{ \begin{pmatrix} -3 \\ 4 \end{pmatrix} \right\}$ B. $\left\{ \begin{pmatrix} 4 \\ -3 \end{pmatrix} \right\}$ C. $\left\{ \begin{pmatrix} -4 \\ 3 \end{pmatrix} \right\}$ D. $\left\{ \begin{pmatrix} 4 \\ 3 \end{pmatrix} \right\}$
- For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$.
 A. 1 B. 0 C. -1 D. $\frac{1}{2}$
- If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is :
 A. 1 B. -1 C. 2 D. -2
- If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
 A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
- Use the given graph on the right, which of the following is false?
 A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$
- Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.

- The graph on the right shows the graph of the function f' . On which interval is the function f concave?
 A. $]-\infty, -2[$ B. $]2, +\infty[$
 C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$
- Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$.
 A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0
- Find the value for the multiplication of $f''(2) g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
 A. -2 B. 1 C. 4 D. -4
- Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$.
 A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
- What is the domain of the function $f(x) = \sqrt{4 - x^2}$?
 A. $]-\infty, -2[\cup]2, +\infty[$ B. $\mathbb{R}$ C. $]-2, 2[$ D. $[-2, 2]$



- An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$. t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
 A. 12 m/s^2 B. 6 m/s^2 C. 18 m/s^2 D. 0 m/s^2
- Use the given graph of the function $y = f(x)$. Which of the following is false?
 A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$
- If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?
 A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
 C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$
- Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.
 A. 1 B. 0 C. 2 D. $\frac{1}{2}$
- Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$
- Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$.
 A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$
- Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$.
 A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6
- Find the point of inflection for $f(x) = x^3 + 3x^2$.
 A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$
- Which of the following function is odd ?
 A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
 C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$
- Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
 A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$
- Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2 ?
 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
- Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
 A. -2 B. 2 C. 5 D. 10
- If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$ Knowing that $f'(5) = 4$ and $g(-2) = 5$.
 A. 3 B. $\frac{5}{12}$ C. 7 D. 5
- Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.
 A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$



28. A man looks at a plane in the sky , at a horizontal distance of 600 m , with an inclination angle of 30° . What is the altitude of the plane?

- A. $600\sqrt{3}\text{ m}$ B. $200\sqrt{3}\text{ m}$ C. 200 m D. $600\sqrt{2}\text{ m}$

29. If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.

- A. 10 B. 21 C. 31 D. 35

30. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.

- A. 30 B. 10 C. $\frac{28}{3}$ D. 28

31. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.

- A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$

32. Find the value of $\int_1^3 \ln 9x\, dx$.

- A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$

33. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0

34. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^x + 1}{e^x - 1}$.

- A. $y = -1$, $y = 2$ B. $y = -1$, $y = 0$ C. $y = 0$, $y = 2$ D. $y = 1$, $y = 0$

35. The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.

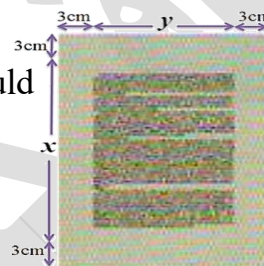
- A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

36. A graphic is designer is planning to design a rectangular page that should

contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide . What should

the dimensions of the page be so that the least amount of paper is used?

- A. $\begin{cases} \text{lenght} = 20\text{ cm} \\ \text{width} = 18\text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23\text{ cm} \\ \text{width} = 23\text{ cm} \end{cases}$
C. $\begin{cases} \text{lenght} = 17\text{ cm} \\ \text{width} = 17\text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22\text{ cm} \\ \text{width} = 22\text{ cm} \end{cases}$



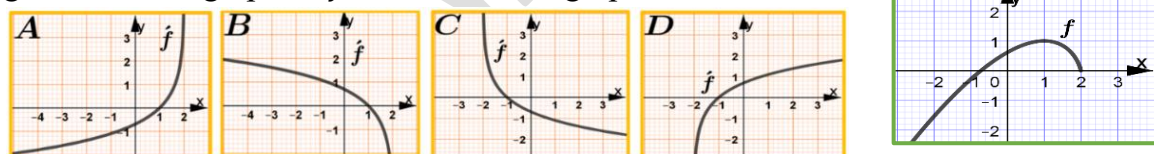
37. Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.

- A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$

38. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

- A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$

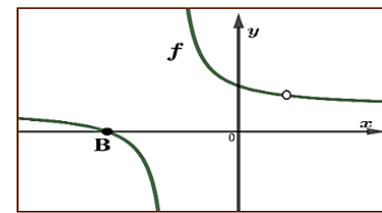
39. The graph on the right shows the graph of f , determine the graph of its derivative.



40. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$

41. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.

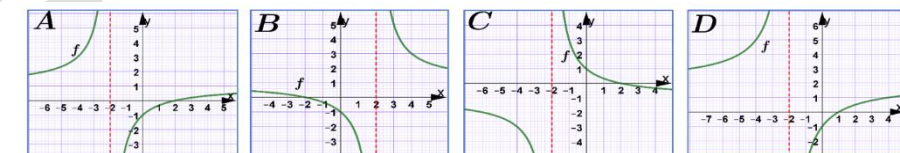
- A. 10 B. $\frac{18}{\sqrt{10}}$
C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$



42. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

- A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

43. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$



44. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$. A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$

45. Find the value of $\int_1^2 \int_{x^2}^{\frac{3}{x^2}-2} dx$. A. $\frac{1}{2}$ B. $-\frac{21}{2}$ C. $-\frac{1}{2}$ D. $\frac{21}{2}$

46. Find the value of $\int \frac{2-3\cos x}{4} dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

47. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.

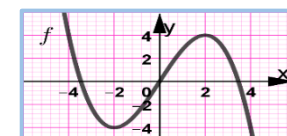
- A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$

48. Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?

- A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0]$

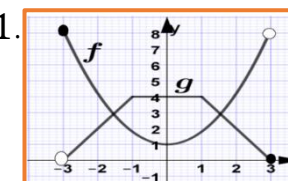
49. Use the given graph of the function f , find the value of x where $f'(x) = 0$.

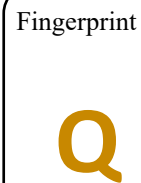
- A. $x = -2$ B. $x = 2$
C. $x = 0$ D. both (A and B)



50. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.

- A. $b = 1$ B. $b = 0$
C. $b = 3$ D. $b = 4$





Choose the correct answer, two marks for each question

- The graph on the right shows the graph of f , determine the graph of its derivative.
- Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.

A. 2
B. 3
C. $\frac{1}{2}$
D. $\frac{1}{6}$
- Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$.

A. $\frac{4}{5}$
B. $\frac{1}{2}$
C. $\frac{5}{4}$
D. 0
- For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$

C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$

B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$

D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$
- Find the value of $\int_1^3 \ln 9x \, dx$.

A. $\ln 9x - 2$
B. $9 \ln 3x - 2$
C. $7 \ln 3x + 2$
D. $7 \ln 3x - 2$
- Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.

A. $k = -1$
B. $k = -6$
C. $k = 1$
D. $k = 6$
- Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.

A. -2
B. 2
C. 5
D. 10
- If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$

C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$

B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$

D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$
- Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$.

A. $-\infty$
B. $+\infty$
C. $-\frac{3}{2}$
D. $\frac{3}{2}$
- Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$

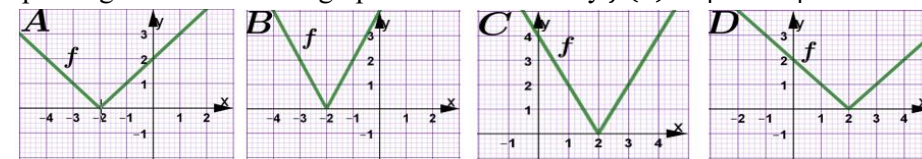
C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$

B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$

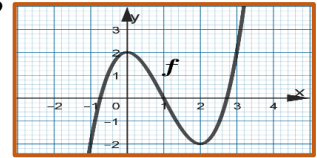
D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$
- Find the point of inflection for $f(x) = x^3 + 3x^2$.

A. $(2, -1)$
B. $(-1, 2)$
C. $(1, 4)$
D. $(-1, 4)$

12. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.



13. Use the given graph of the function $y = f(x)$. Which of the following is false?



- A. $f'(1) < 0$
B. $f'(0) + f''(1) = 0$
- C. $f''(2) < 0$
D. $f''(-1) < f''(3)$

14. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.

- A. $y = x + 2$
B. $y = -x + 2$
C. $y = x - 2$
D. $y = -x - 2$

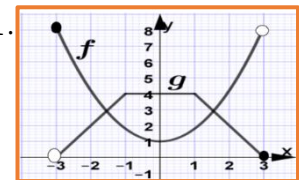
15. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$.

A. $\frac{1}{3}$
B. 2
C. $\frac{3}{2}$
D. $\frac{2}{3}$

16. What is the domain of the function $f(x) = \sqrt{4 - x^2}$?

- A. $]-\infty, -2] \cup [2, +\infty[$
B. $\mathbb{R}$
C. $]-2, 2[$
D. $[-2, 2]$

17. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.



- A. $b = 1$
B. $b = 0$
- C. $b = 3$
D. $b = 4$

18. Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.

- A. $\frac{x}{3} - \frac{y}{2} = 1$
B. $\frac{x}{3} + \frac{y}{2} = -1$
C. $\frac{x}{2} + \frac{y}{3} = 1$
D. $\frac{-x}{3} + \frac{y}{2} = 1$

19. On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing?

- A. $]-\infty, 0[$
B. $[2, +\infty[$
C. $]0, 4[$
D. $]0, 2[$

20. Which of the following function is odd?

- A. $f(x) = \frac{x}{|x-1|-|x+1|}$
B. $f(x) = x^2 + \sin x$

- C. $f(x) = x^2 \cos x$
D. $f(x) = \frac{3}{x}$

21. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.

- A. $3 + e^2$
B. $4 + e^2$
C. e^2
D. $2 + e^2$

22. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$.

- Knowing that $f'(5) = 4$ and $g(-2) = 5$.

A. 3
B. $\frac{5}{12}$
C. 7
D. 5

23. Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?

- A. $]0, 2[$
B. $[2, +\infty[$
C. $]0, +\infty[$
D. $]-\infty, 0]$

24. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.

A. 1
B. 0
C. 2
D. $\frac{1}{2}$

25. Find the value for the multiplication of $f''(2) g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$

- A. -2
B. 1
C. 4
D. -4

26. Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.

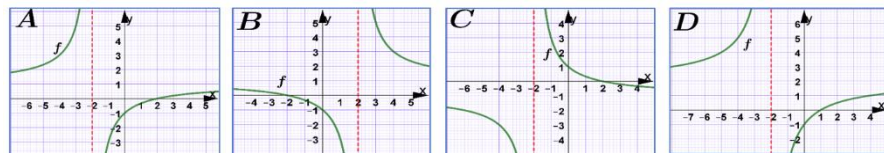
- A. $\left\{ \begin{pmatrix} -3 \\ 4 \end{pmatrix} \right.$

C. $\left\{ \begin{pmatrix} -4 \\ 3 \end{pmatrix} \right.$

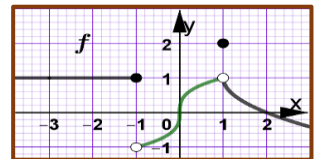
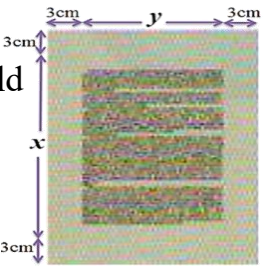
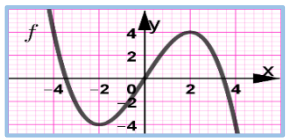
B. $\left\{ \begin{pmatrix} 4 \\ -3 \end{pmatrix} \right.$

D. $\left\{ \begin{pmatrix} 4 \\ 3 \end{pmatrix} \right.$

27. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^x + 1}{e^x - 1}$.
- A. $y = -1, y = 2$ B. $y = -1, y = 0$ C. $y = 0, y = 2$ D. $y = 1, y = 0$
28. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:
- A. 1 B. -1 C. 2 D. -2
29. For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2 - 3x - 9}{x - 3} & x \neq 3 \\ bx - 3 & x = 3 \end{cases}$ have no points of discontinuity?
- A. 3 B. 4 C. 6 D. 12
30. Find the value of $\int_1^2 \left(\frac{3}{x^2} - 2\right) dx$.
- A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$
31. The figure on the right shows the graph of the function $f(x) = \frac{x^2 + 2x - 8}{x^2 - 4}$. Find the distance between the point B and the line $x - 3y = -14$.
- A. 10 B. $\frac{18}{\sqrt{10}}$ C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$
32. The graph on the right shows the graph of the function f' . On which interval is the function f concave?
- A. $]-\infty, -2[$ B. $]2, +\infty[$ C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$
33. The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.
- A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2
34. Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x - 15}{x^2 + 3x + a}$.
- A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$
35. Find the value of $\int \frac{2 - 3\cos x}{4} dx$.
- A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$ C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$
36. Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2?
- A. $f(x) = \frac{4}{3 - 3x}$ B. $f(x) = \frac{-4}{x + 1}$ C. $f(x) = \frac{1 - 3x}{x + 2}$ D. $f(x) = \frac{2x + 1}{x - 1}$
37. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
- A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$ C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
38. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$.
- A. $-\infty$ B. $+\infty$ C. -1 D. 0
39. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
- A. 30 B. 10 C. $\frac{28}{3}$ D. 28
40. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$



41. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$. t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
- A. 12 m/s^2 B. 6 m/s^2 C. 18 m/s^2 D. 0 m/s^2
42. Use the given graph of the function f , find the value of x where $f'(x) = 0$.
- A. $x = -2$ B. $x = 2$ C. $x = 0$ D. both (A and B)
43. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6} - 3}{x-3}$.
- A. 0 B. $\frac{-1}{6}$ C. $\frac{1}{6}$ D. 6
44. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.
- A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
45. Find the x -intercepts of the graph of the function $f(x) = (x + 2)\sqrt{4 + x^2}$.
- A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$
46. If $\int_{-1}^1 f(x) dx = 5$ and $\int_{-1}^1 h(x) dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)] dx$.
- A. 10 B. 21 C. 31 D. 35
47. A man looks at a plane in the sky, at a horizontal distance of 600 m , with an inclination angle of 30° . What is the altitude of the plane?
- A. $600\sqrt{3} \text{ m}$ B. $200\sqrt{3} \text{ m}$ C. 200 m D. $600\sqrt{2} \text{ m}$
48. A graphic designer is planning to design a rectangular page that should contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?
- A. $\begin{cases} \text{length} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{length} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$ C. $\begin{cases} \text{length} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{length} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$
49. Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$.
- A. 1 B. 0 C. -1 D. $\frac{1}{2}$
50. Use the given graph on the right, which of the following is false?
- A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$ C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$

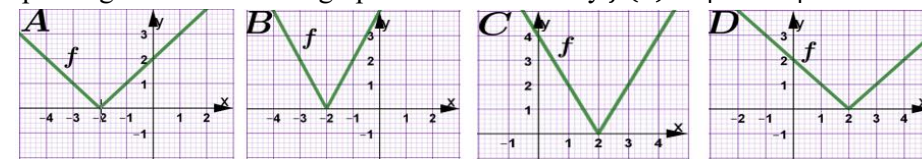




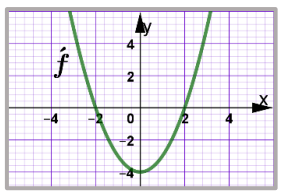
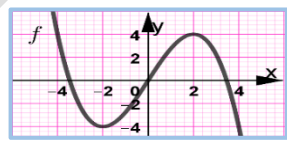
Choose the correct answer, two marks for each question

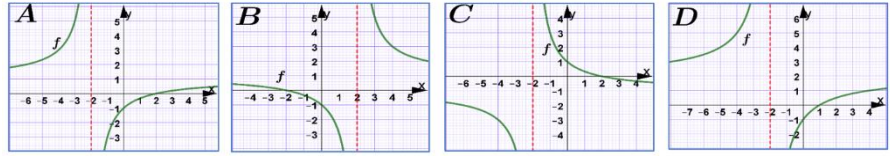
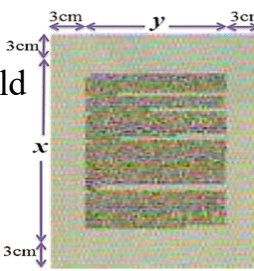
- Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$.
 A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$
- Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
 A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0[$
- An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
 A. 12 m/s^2 B. 6 m/s^2 C. 18 m/s^2 D. 0 m/s^2
- If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?
 A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
 C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$
- Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
 A. -2 B. 2 C. 5 D. 10
- Use the given graph on the right, which of the following is false?
 A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$
- The graph on the right shows the graph of f , determine the graph of its derivative.
- The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.
 A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$
- Use the given graph of the function $y = f(x)$. Which of the following is false?
 A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$
- Find the value of $\int_1^2 \left(\frac{3}{x^2} - 2\right) dx$.
 A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$
- Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
 A. -2 B. 1 C. 4 D. -4

12. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.



- Find the value of $\int_1^3 \ln 9x dx$.
 A. $\ln 9x - 2$ B. $9 \ln 3x - 2$ C. $7 \ln 3x + 2$ D. $7 \ln 3x - 2$
- Which of the following function is odd?
 A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
 C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$
- If $\int_{-1}^1 f(x) dx = 5$ and $\int_{-1}^1 h(x) dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)] dx$.
 A. 10 B. 21 C. 31 D. 35
- For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?
 A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$
- The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.
 A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2
- Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.
 A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$
- Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2 ?
 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$.
 A. 1 B. 0 C. -1 D. $\frac{1}{2}$
- Find the value of $\int \frac{2-3\cos x}{4} dx$.
 A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
 C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$
- Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$.
 A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0
- Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.
 A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
- Use the given graph to find the value of b if you know that $f(g(b)) = 1$.
- For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12

26. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.
 A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
27. The graph on the right shows the graph of the function f' .
 On which interval is the function f concave?
 A. $]-\infty, -2[$ B. $]2, +\infty[$
 C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$
- 
28. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0
29. Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
 A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$
30. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^x + 1}{e^x - 1}$.
 A. $y = -1, y = 2$ B. $y = -1, y = 0$ C. $y = 0, y = 2$ D. $y = 1, y = 0$
31. Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2 + 5}{2x^2 + 1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
32. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
 A. 30 B. 10 C. $\frac{28}{3}$ D. 28
33. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$.
 Knowing that $f'(5) = 4$ and $g(-2) = 5$. A. 3 B. $\frac{5}{12}$ C. 7 D. 5
34. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
 A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
35. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.
 A. $f(x) = \frac{x^2 - 1}{x + 1}$, $g(x) = x + 1$ B. $f(x) = \frac{x - 1}{\sqrt{x} - 1}$, $g(x) = \sqrt{x} + 1$
 C. $f(x) = \frac{x^3 - 1}{x - 1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2 - 4}{x - 2}$, $g(x) = x - 2$
36. Use the given graph of the function f , find the value of x where $f'(x) = 0$.
 A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)
- 
37. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$
38. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.
 A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$
39. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:
 A. 1 B. -1 C. 2 D. -2

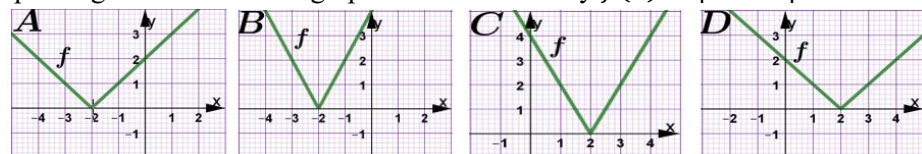
40. A man looks at a plane in the sky, at a horizontal distance of 600 m , with an inclination angle of 30° . What is the altitude of the plane?
 A. $600\sqrt{3} \text{ m}$ B. $200\sqrt{3} \text{ m}$ C. 200 m D. $600\sqrt{2} \text{ m}$
41. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6} - 3}{x-3}$. A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6
42. Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$
43. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$.
- 
44. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2 + 3x - 1}{x - 1}$.
 A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$
45. On which interval is the function $f(x) = e^{(x^3 - 3x^2)}$ decreasing?
 A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$
46. What is the domain of the function $f(x) = \sqrt{4 - x^2}$?
 A. $]-\infty, -2] \cup [2, +\infty[$ B. $\mathbb{R}$ C. $]-2, 2[$ D. $[-2, 2]$
47. Find the point of inflection for $f(x) = x^3 + 3x^2$.
 A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$
48. A graphic is designer is planning to design a rectangular page that should contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?
- 
- A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
 C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$
49. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$. A. 1 B. 0 C. 2 D. $\frac{1}{2}$
50. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x + 5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$. A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$



Choose the correct answer, two marks for each question

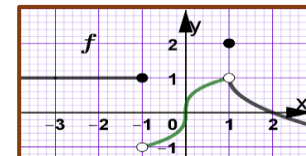
- Find the point of inflection for $f(x) = x^3 + 3x^2$.
 A. (2, -1) B. (-1, 2) C. (1, 4) D. (-1, 4)
- Find the equation of a line passing through the points (0, 2) and (-3, 0).
 A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
- For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?
 A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$
- Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
 A. -2 B. 1 C. 4 D. -4
- An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
 A. 12 m/s² B. 6 m/s² C. 18 m/s² D. 0 m/s²
- Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.
 A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$
- Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$.
 A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6
- Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point (-1, 0).
 A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
- Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x - 1}$.
 A. $y = -1, y = 2$ B. $y = -1, y = 0$ C. $y = 0, y = 2$ D. $y = 1, y = 0$
- For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12
- Find b so that the points (3, 5), (b, 0) and (-4, 10) are collinear.
 A. -2 B. 2 C. 5 D. 10
- A man looks at a plane in the sky, at a horizontal distance of 600 m, with an inclination angle of 30°. What is the altitude of the plane?
 A. $600\sqrt{3}$ m B. $200\sqrt{3}$ m C. 200 m D. $600\sqrt{2}$ m

13. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.



14. Use the given graph on the right, which of the following is false?

A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$



15. Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$

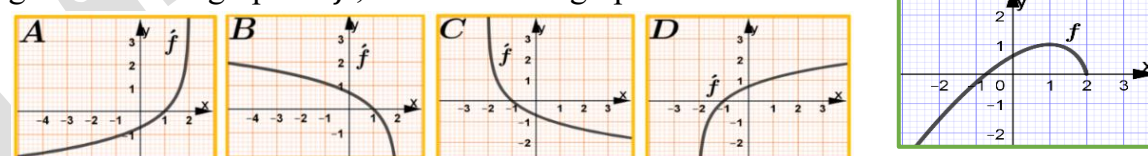
16. Find the value of $\int_1^3 \ln 9x dx$.

A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$

17. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:

A. 1 B. -1 C. 2 D. -2

18. The graph on the right shows the graph of f , determine the graph of its derivative.



19. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0

20. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.

A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$

21. Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?

A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0]$

22. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$. A. 1 B. 0 C. 2 D. $\frac{1}{2}$

23. Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2? A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$

24. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.

A. 30 B. 10 C. $\frac{28}{3}$ D. 28

25. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
 C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$

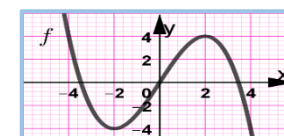
26. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0

27. Which of the following function is odd? A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$

C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$

28. Use the given graph of the function f , find the value of x where $f'(x) = 0$.

A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)



29. What is the domain of the function $f(x) = \sqrt{4 - x^2}$?
 A. $]-\infty, -2] \cup [2, +\infty[$ B. $\mathbb{R}$ C. $]-2, 2[$ D. $[-2, 2]$

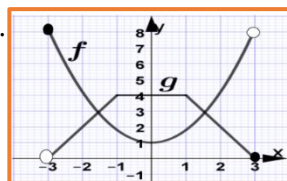
30. Find the value of a when $x = -1$ is being the vertical asymptote of
 function $f(x) = \frac{3x-15}{x^2+3x+a}$. A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$

31. Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$

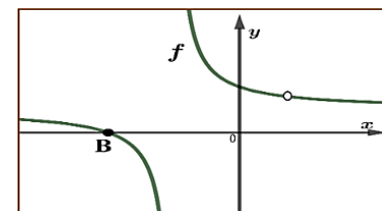
32. Find the value of $\int \frac{2-3\cos x}{4} dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
 C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

33. If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.
 A. 10 B. 21 C. 31 D. 35

34. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.
 A. $b = 1$ B. $b = 0$
 C. $b = 3$ D. $b = 4$



35. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$
 Find the distance between the point **B** and the line $x - 3y = -14$.



- A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$

36. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$

37. Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.

- A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$

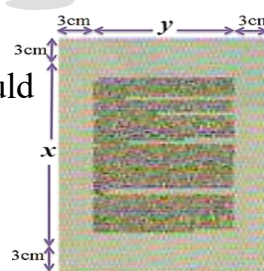
38. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.

- A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$

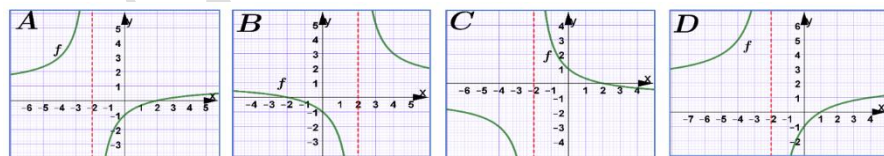
39. A graphic is designer is planning to design a rectangular page that should

contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide . What should
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- A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
 C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$



40. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine
 the graph of the function $f(x) = \frac{x-2}{x+2}$



41. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis
 and the two lines $x = 0$ and $x = 2$.

- A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$

42. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

- A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
 C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$

43. On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing ?

- A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$

44. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.

- A. (0 , 2) B. (2 , 0) C. (-2 , 0) D. (0 , 4)

45. The tangent line to the graph of a function h at the point (3 , 6) passes through the
 point (-1 , 4) . Find the value of $h'(3)$.

- A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

46. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$

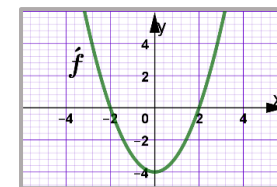
Knowing that $f'(5) = 4$ and $g(-2) = 5$. A. 3 B. $\frac{5}{12}$ C. 7 D. 5

47. Find the value of $\int_1^2 \int (\frac{3}{x^2} - 2) dx$. A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$

48. The graph on the right shows the graph of the function f' .

On which interval is the function f concave?

- A. $]-\infty, -2[$ B. $]2, +\infty[$
 C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$

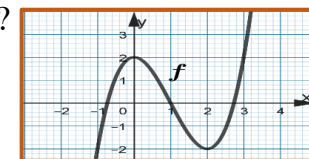


49. Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with
 the function $g(x) = x + 2$ at $x = 1$.

- A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$

50. Use the given graph of the function $y = f(x)$. Which of the following is false?

- A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$





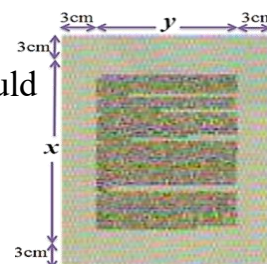
Choose the correct answer, two marks for each question

1. Find the value of $\int_1^2 \int (\frac{3}{x^2} - 2) dx$. A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$

2. Find the value of $\int_1^3 \ln 9x dx$.
 A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$

3. A graphic is designer is planning to design a rectangular page that should contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide . What should the dimensions of the page be so that the least amount of paper is used?

- A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
 C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$

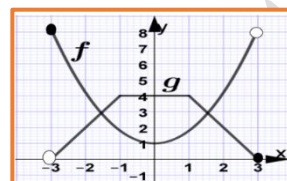


4. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$

5. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $\frac{-1}{6}$ C. $\frac{1}{6}$ D. 6

6. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.

- A. $b = 1$ B. $b = 0$
 C. $b = 3$ D. $b = 4$



7. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
 A. 30 B. 10 C. $\frac{28}{3}$ D. 28

8. The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$.Find the value of $h'(3)$.

- A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

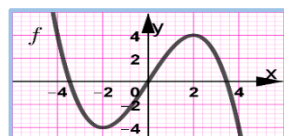
9. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
 A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$

10. What is the domain of the function $f(x) = \sqrt{4-x^2}$?
 A. $]-\infty, -2] \cup [2, +\infty[$ B. $\mathbb{R}$ C. $]-2, 2[$ D. $[-2, 2]$

11. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0

12. Use the given graph of the function f , find the value of x where $f'(x) = 0$.

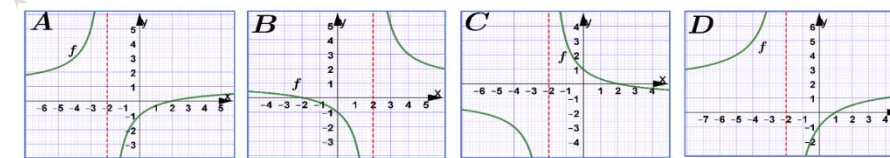
- A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)



13. If $f'(x) = 2x - 3$,find the function $f(x)$. Knowing that $f(-2) = 1$.

- A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$

14. Use the intercepts , symmetry , asymptotes , first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$



15. Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.

- A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$

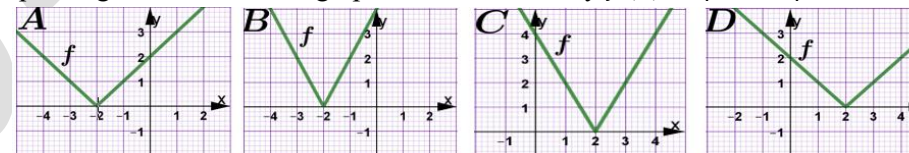
16. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is :

- A. 1 B. -1 C. 2 D. -2

17. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$. t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.

- A. 12 m/s^2 B. 6 m/s^2 C. 18 m/s^2 D. 0 m/s^2

18. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.



19. A man looks at a plane in the sky , at a horizontal distance of 600 m , with an inclination angle of 30° . What is the altitude of the plane?

- A. $600\sqrt{3} \text{ m}$ B. $200\sqrt{3} \text{ m}$ C. 200 m D. $600\sqrt{2} \text{ m}$

20. Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.

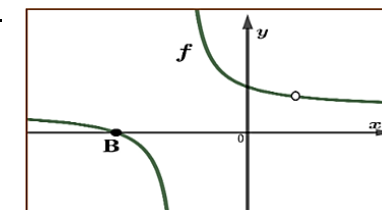
- A. -2 B. 2 C. 5 D. 10

21. Find the value for the multiplication of $f''(2) g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$

- A. -2 B. 1 C. 4 D. -4

22. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.

- A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$



23. Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.

- A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$

24. Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.

- A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$

25. Use the intermediate vale theorem (IVT) , Which of the following functions where $f(x) = 0$ has a root between 0 and 2 ?

- A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$

26. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$

B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$

C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$

D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$

27. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$

B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$

C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$

D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

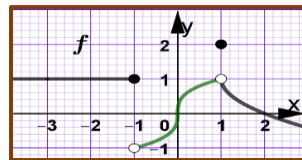
28. Use the given graph on the right, which of the following is false?

A. $\lim_{x \rightarrow 1^-} f(x) = 1$

B. $\lim_{x \rightarrow 2} f(x) = 0$

C. $\lim_{x \rightarrow -1^+} f(x) = -1$

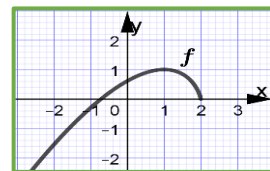
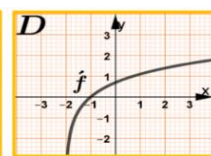
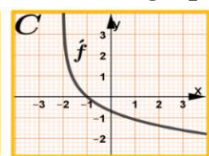
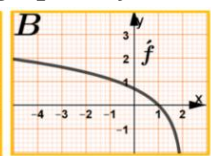
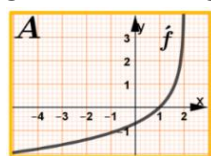
D. $\lim_{x \rightarrow 1} f(x) = f(1)$



29. Find the value of $\int \frac{2-3\cos x}{4} dx$.
 A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
 C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

30. Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$

31. The graph on the right shows the graph of f , determine the graph of its derivative.



32. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.

A. $3 + e^2$

B. $4 + e^2$

C. e^2

D. $2 + e^2$

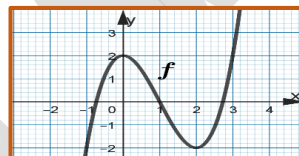
33. Use the given graph of the function $y = f(x)$. Which of the following is false?

A. $f'(1) < 0$

B. $f'(0) + f''(1) = 0$

C. $f''(2) < 0$

D. $f''(-1) < f''(3)$



34. Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?

A. $]0, 2[$

B. $]2, +\infty[$

C. $]0, +\infty[$

D. $] -\infty, 0]$

35. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$

B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$

C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$

D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$

36. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^x+1}{e^x-1}$.

A. $y = -1$, $y = 2$

B. $y = -1$, $y = 0$

C. $y = 0$, $y = 2$

D. $y = 1$, $y = 0$

37. Find the point of inflection for $f(x) = x^3 + 3x^2$.

A. $(2, -1)$

B. $(-1, 2)$

C. $(1, 4)$

D. $(-1, 4)$

38. If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.

A. 10

B. 21

C. 31

D. 35

39. The graph on the right shows the graph of the function f' .

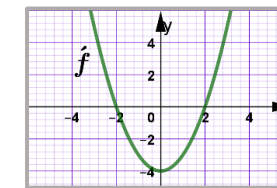
On which interval is the function f concave?

A. $] -\infty, -2[$

B. $]2, +\infty[$

C. $] -\infty, -2[\cup]2, +\infty[$

D. $]0, +\infty[$



40. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.

A. $y = -4x - 4$

B. $y = -4x + 1$

C. $y = 4x - 4$

D. $y = 4x + 3$

41. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0

42. On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing?

A. $] -\infty, 0[$

B. $]2, +\infty[$

C. $]0, 4[$

D. $]0, 2[$

43. Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$

44. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$.

Knowing that $f'(5) = 4$ and $g(-2) = 5$.

A. 3

B. $\frac{5}{12}$

C. 7

D. 5

45. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.

A. $(0, 2)$

B. $(2, 0)$

C. $(-2, 0)$

D. $(0, 4)$

46. For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?

A. 3

B. 4

C. 6

D. 12

47. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$. A. 1 B. 0 C. 2 D. $\frac{1}{2}$

48. Find the value of a when $x = -1$ is being the vertical asymptote of

function $f(x) = \frac{3x-15}{x^2+3x+a}$.

A. $a = -1$

B. $a = 2$

C. $a = -2$

D. $a = 1$

49. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$. A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$

50. Which of the following function is odd?

A. $f(x) = \frac{x}{|x-1|-|x+1|}$

B. $f(x) = x^2 + \sin x$

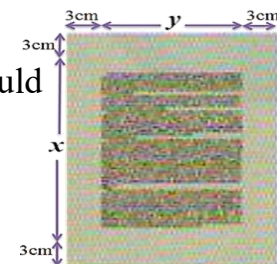
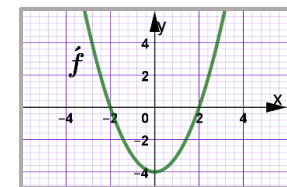
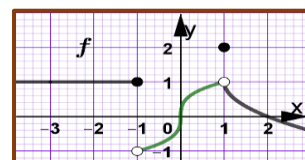
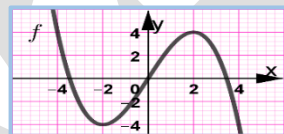
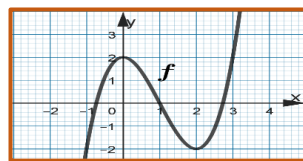
C. $f(x) = x^2 \cos x$

D. $f(x) = \frac{3}{x}$

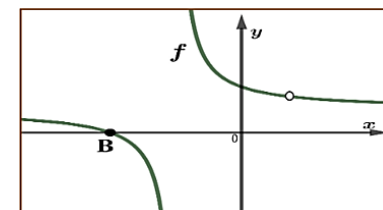


Choose the correct answer, two marks for each question

- Find the point of inflection for $f(x) = x^3 + 3x^2$.
 A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$
- Find the value of $\int_1^3 \ln 9x \, dx$.
 A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$
- If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
 A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
- Use the given graph of the function $y = f(x)$. Which of the following is false?
 A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$
- Determine the two functions of the following that match at all value of x with the exception of $x = 1$.
 A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
 C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$
- On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing?
 A. $] -\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$
- Use the given graph of the function f , find the value of x where $f'(x) = 0$.
 A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)
- Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
 A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0]$
- Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x - 1}$.
 A. $y = -1$, $y = 2$ B. $y = -1$, $y = 0$ C. $y = 0$, $y = 2$ D. $y = 1$, $y = 0$
- If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:
 A. 1 B. -1 C. 2 D. -2
- Use the given graph on the right, which of the following is false?
 A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$
- For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?
 A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

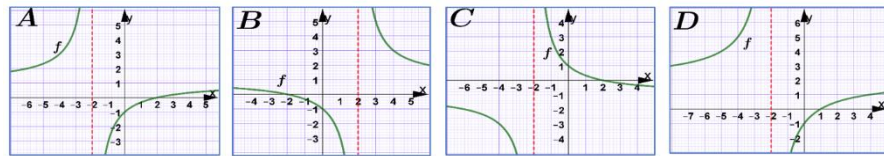


- Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2?
 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
- The graph on the right shows the graph of the function f' . On which interval is the function f concave?
 A. $] -\infty, -2[$ B. $]2, +\infty[$
 C. $] -\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$
- A man looks at a plane in the sky, at a horizontal distance of 600 m, with an inclination angle of 30° . What is the altitude of the plane?
 A. $600\sqrt{3} \, m$ B. $200\sqrt{3} \, m$ C. $200 \, m$ D. $600\sqrt{2} \, m$
- A graphic designer is planning to design a rectangular page that should contain $289 \, cm^2$ of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?
 A. $\begin{cases} \text{length} = 20 \, cm \\ \text{width} = 18 \, cm \end{cases}$ B. $\begin{cases} \text{length} = 23 \, cm \\ \text{width} = 23 \, cm \end{cases}$
 C. $\begin{cases} \text{length} = 17 \, cm \\ \text{width} = 17 \, cm \end{cases}$ D. $\begin{cases} \text{length} = 22 \, cm \\ \text{width} = 22 \, cm \end{cases}$
- The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.
 A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2
- Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$.
 A. -2 B. 1 C. 4 D. -4
- Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
 A. -2 B. 2 C. 5 D. 10
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$.
 A. 1 B. 0 C. -1 D. $\frac{1}{2}$
- Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
 A. 30 B. 10 C. $\frac{28}{3}$ D. 28
- An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
 A. $12 \, m/s^2$ B. $6 \, m/s^2$ C. $18 \, m/s^2$ D. $0 \, m/s^2$
- For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12
- The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.
 A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$



25. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine

the graph of the function $f(x) = \frac{x-2}{x+2}$



26. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.

A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$

27. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$

28. Find the value of $\int \frac{2-3\cos x}{4} dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

29. If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.

A. 10 B. 21 C. 31 D. 35

30. Find the value of a when $x = -1$ is being the vertical asymptote of

function $f(x) = \frac{3x-15}{x^2+3x+a}$.

A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$

31. Find the value of $\int_1^2 \int_{x^2}^{\frac{3}{x^2}-2} dx$. A. $\frac{1}{2}$ B. $-\frac{21}{2}$ C. $-\frac{1}{2}$ D. $\frac{21}{2}$

32. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$

Knowing that $f'(5) = 4$ and $g(-2) = 5$.

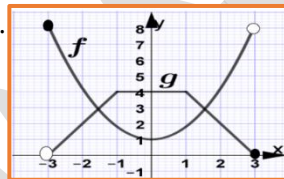
A. 3 B. $\frac{5}{12}$ C. 7 D. 5

33. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6

34. Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$

35. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.

A. $b = 1$ B. $b = 0$
C. $b = 3$ D. $b = 4$



36. Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.

A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$

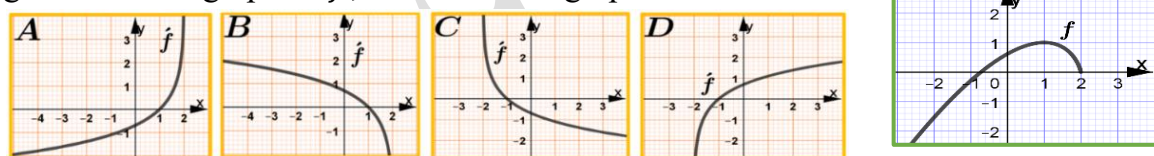
37. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.

A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$

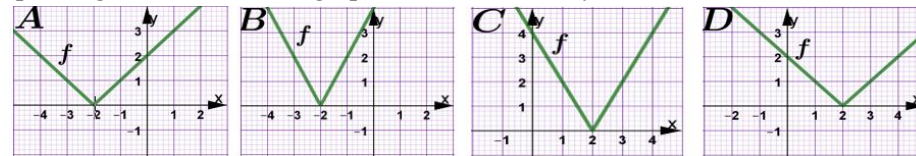
38. What is the domain of the function $f(x) = \sqrt{4-x^2}$?

A. $]-\infty, -2] \cup [2, +\infty[$ B. $\mathbb{R}$ C. $]-2, 2[$ D. $[-2, 2]$

39. The graph on the right shows the graph of f , determine the graph of its derivative.



40. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.



41. Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.

A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$

42. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0

43. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$. A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$

44. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.

A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$

45. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.

A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$

46. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$

47. Which of the following function is odd? A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$

48. Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.

A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$

49. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0

50. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$. A. 1 B. 0 C. 2 D. $\frac{1}{2}$



Choose the correct answer, two marks for each question

1. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
 A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$

2. The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.

A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

3. Which of the following function is odd ?
 A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
 C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$

4. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
 C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$

5. Find the point of inflection for $f(x) = x^3 + 3x^2$.

A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$

6. Find the value of $\int_1^2 \int (\frac{3}{x^2} - 2) dx$.
 A. $\frac{1}{2}$ B. $-\frac{21}{2}$ C. $-\frac{1}{2}$ D. $\frac{21}{2}$

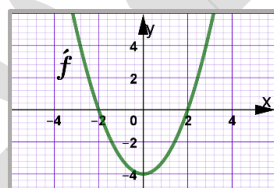
7. Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.

A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$

8. The graph on the right shows the graph of the function f' .

On which interval is the function f concave?

A. $]-\infty, -2[$ B. $]2, +\infty[$
 C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$



9. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

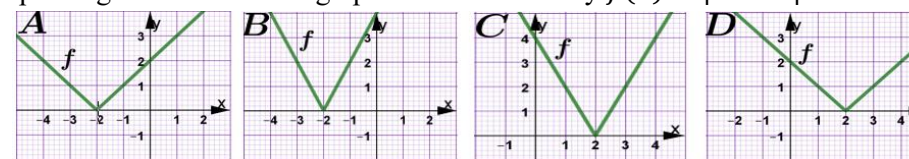
10. Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.

A. -2 B. 2 C. 5 D. 10

11. On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing?

A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$

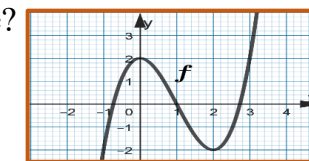
12. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.



13. For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12

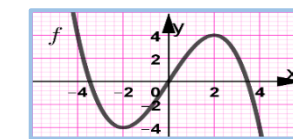
14. Use the given graph of the function $y = f(x)$. Which of the following is false?

A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$



15. Use the given graph of the function f , find the value of x where $f'(x) = 0$.

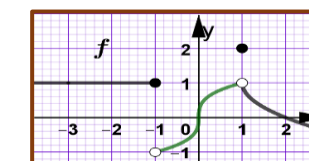
A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)



16. Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2?
 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$

17. Use the given graph on the right, which of the following is false?

A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$



18. Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.

A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$

19. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$.

Knowing that $f'(5) = 4$ and $g(-2) = 5$.
 A. 3 B. $\frac{5}{12}$ C. 7 D. 5

20. Find the value of $\int \frac{2-3\cos x}{4} dx$.
 A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
 C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

21. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$.
 A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$

22. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.

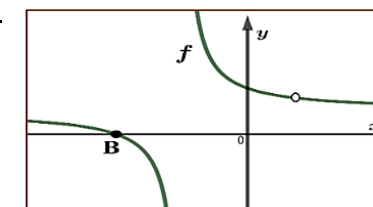
A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$

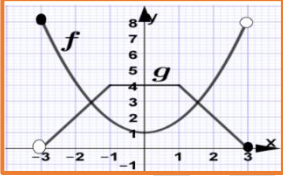
23. Find the value of $\int_1^3 \ln 9x dx$.

A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$

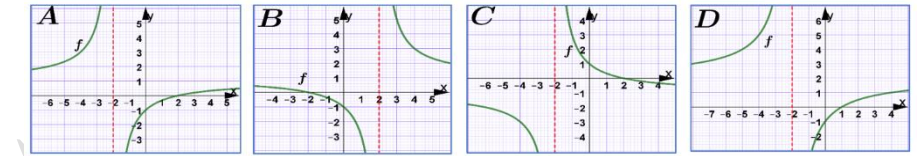
24. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.

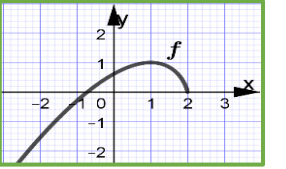
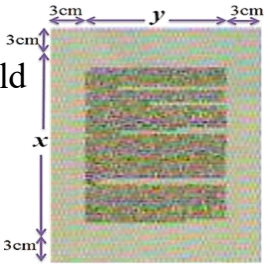
A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$



25. Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
 A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0[$
26. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is :
 A. 1 B. -1 C. 2 D. -2
27. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$.
 A. 1 B. 0 C. 2 D. $\frac{1}{2}$
28. Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
29. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
 A. 12 m/s^2 B. 6 m/s^2 C. 18 m/s^2 D. 0 m/s^2
30. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^x+1}{e^x-1}$.
 A. $y = -1, y = 2$ B. $y = -1, y = 0$ C. $y = 0, y = 2$ D. $y = 1, y = 0$
31. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
 A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
32. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.
 A. $b = 1$ B. $b = 0$
 C. $b = 3$ D. $b = 4$
- 
33. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.
 A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$
34. A man looks at a plane in the sky, at a horizontal distance of 600 m , with an inclination angle of 30° . What is the altitude of the plane?
 A. $600\sqrt{3} \text{ m}$ B. $200\sqrt{3} \text{ m}$ C. 200 m D. $600\sqrt{2} \text{ m}$
35. If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.
 A. 10 B. 21 C. 31 D. 35
36. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.
 A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$
37. What is the domain of the function $f(x) = \sqrt{4-x^2}$?
 A. $] -\infty, -2] \cup [2, +\infty[$ B. $\mathbb{R}$ C. $] -2, 2[$ D. $[-2, 2]$
38. Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$
39. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
 A. 30 B. 10 C. $\frac{28}{3}$ D. 28
40. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0

41. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$



42. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6
43. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.
 A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
 C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$
44. Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$
45. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.
 A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
46. Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$.
 A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$
47. The graph on the right shows the graph of f , determine the graph of its derivative.
- 
48. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0
49. Find the value for the multiplication of $f''(2) g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
 A. -2 B. 1 C. 4 D. -4
50. A graphic is designer is planning to design a rectangular page that should contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?
- 

- A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
 C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$

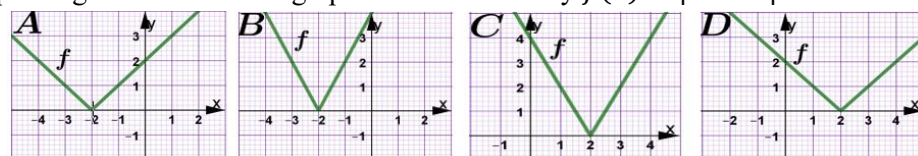


Choose the correct answer, two marks for each question

1. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0

2. Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$

3. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.



4. Find the value of $\int_1^3 \ln 9x \, dx$.
 A. $\ln 9x - 2$ B. $9 \ln 3x - 2$ C. $7 \ln 3x + 2$ D. $7 \ln 3x - 2$

5. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
 A. 30 B. 10 C. $\frac{28}{3}$ D. 28

6. Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
 A. -2 B. 2 C. 5 D. 10

7. Find the value of $\int_1^2 \int (\frac{3}{x^2} - 2) \, dx$. A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$

8. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$. A. 1 B. 0 C. 2 D. $\frac{1}{2}$

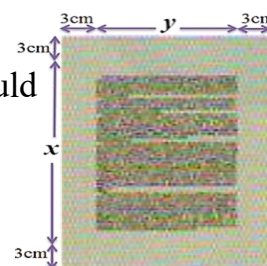
9. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.
 A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$

10. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
 A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$

11. Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$

12. A graphic is designer is planning to design a rectangular page that should contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?

A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
 C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$



13. For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12

14. The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.
 A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

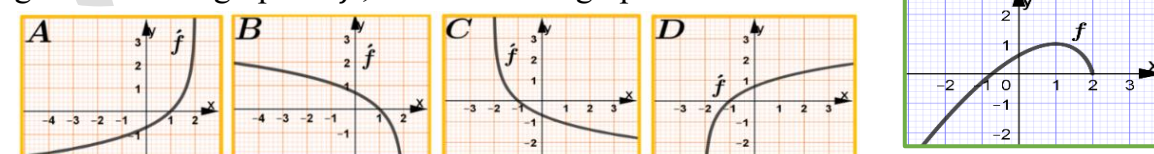
15. If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$

16. Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
 A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$

17. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

18. The graph on the right shows the graph of f , determine the graph of its derivative.



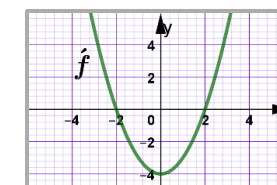
19. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.
 A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$

20. If $\int_{-1}^1 f(x) \, dx = 5$ and $\int_{-1}^1 h(x) \, dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)] \, dx$.
 A. 10 B. 21 C. 31 D. 35

21. The graph on the right shows the graph of the function f' .

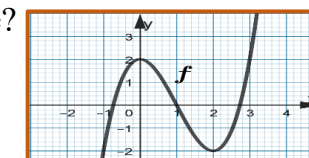
On which interval is the function f concave?

A. $]-\infty, -2[$ B. $]2, +\infty[$
 C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$



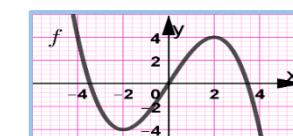
22. Use the given graph of the function $y = f(x)$. Which of the following is false?

A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$



23. Use the given graph of the function f , find the value of x where $f'(x) = 0$.

A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)



24. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$

Knowing that $f'(5) = 4$ and $g(-2) = 5$. A. 3 B. $\frac{5}{12}$ C. 7 D. 5

25. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.

A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$

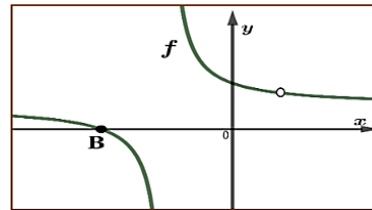
26. Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?

- A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0[$

27. Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$

28. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point **B** and the line $x - 3y = -14$.

- A. 10 B. $\frac{18}{\sqrt{10}}$
C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$



29. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is:

- A. 1 B. -1 C. 2 D. -2

30. A man looks at a plane in the sky, at a horizontal distance of 600 m, with an inclination angle of 30° . What is the altitude of the plane?

- A. $600\sqrt{3}$ m B. $200\sqrt{3}$ m C. 200 m D. $600\sqrt{2}$ m

31. What is the domain of the function $f(x) = \sqrt{4 - x^2}$?

- A. $] -\infty, -2] \cup [2, +\infty[$ B. $\mathbb{R}$ C. $] -2, 2[$ D. $[-2, 2]$

32. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6

33. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.

- A. 12 m/s² B. 6 m/s² C. 18 m/s² D. 0 m/s²

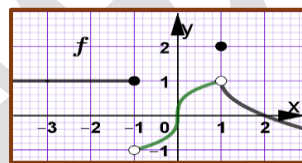
34. Find the equation of a line passing through the points (0, 2) and (-3, 0).

- A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$

35. Find the value of $\int \frac{2-3\cos x}{4} dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$

36. Use the given graph on the right, which of the following is false?

- A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$

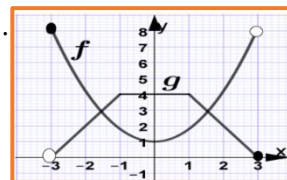


37. Find the point of inflection for $f(x) = x^3 + 3x^2$.

- A. (2, -1) B. (-1, 2) C. (1, 4) D. (-1, 4)

38. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.

- A. $b = 1$ B. $b = 0$
C. $b = 3$ D. $b = 4$



39. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$. A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$

40. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0

41. Which of the following function is odd? A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$

42. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point (-1, 0).

- A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$

43. Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2? A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$

44. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x - 1}$.

- A. $y = -1$, $y = 2$ B. $y = -1$, $y = 0$ C. $y = 0$, $y = 2$ D. $y = 1$, $y = 0$

45. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

- A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$

46. Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$. A. -2 B. 1 C. 4 D. -4

47. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

- A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$

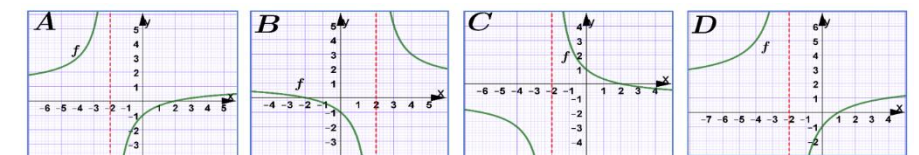
48. On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing?

- A. $] -\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$

49. Find the value of a when $x = -1$ is being the vertical asymptote of

function $f(x) = \frac{3x-15}{x^2+3x+a}$. A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$

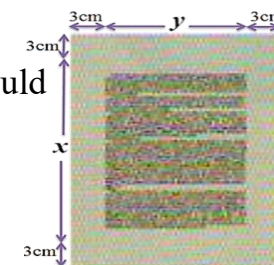
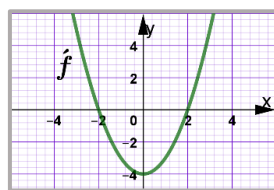
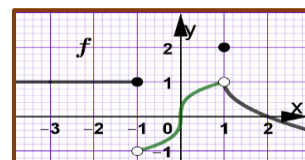
50. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$.



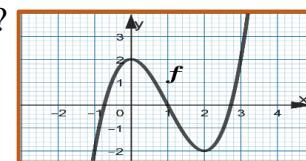


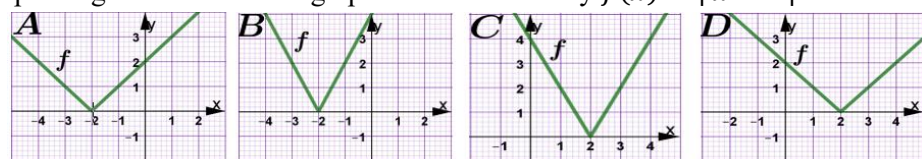
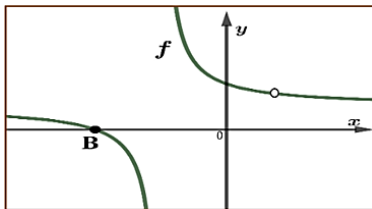
Choose the correct answer, two marks for each question

- Find the value of $\int_1^2 \int (\frac{3}{x^2} - 2) dx$. A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$
- If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$. A. 10 B. 21 C. 31 D. 35
- Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $] -\infty, 0[$
- For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?
A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$
- Use the given graph on the right, which of the following is false?
A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$
- Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.
A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$
- Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.
A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
- Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2?
A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
- What is the domain of the function $f(x) = \sqrt{4-x^2}$?
A. $] -\infty, -2] \cup [2, +\infty[$ B. $\mathbb{R}$ C. $] -2, 2[$ D. $[-2, 2]$
- Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
A. 30 B. 10 C. $\frac{28}{3}$ D. 28
- Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
- The graph on the right shows the graph of the function f' .
On which interval is the function f concave?
A. $] -\infty, -2[$ B. $]2, +\infty[$
C. $] -\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$
- Which of the following function is odd?
A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$

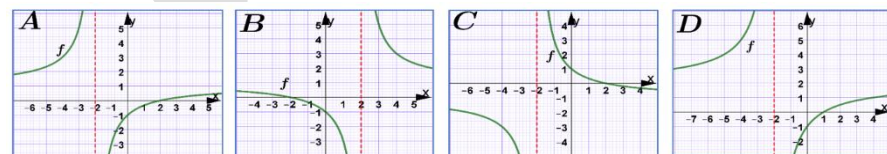


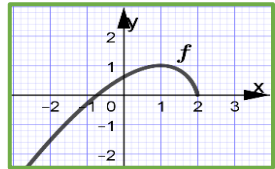
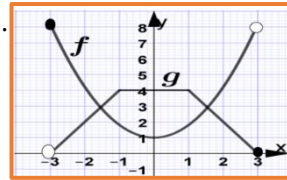
- A graphic designer is planning to design a rectangular page that should contain 289 cm^2 of print. Each of the four margins is to be 3cm wide. What should the dimensions of the page be so that the least amount of paper is used?
A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$
- Determine the two functions of the following that match at all value of x with the exception of $x = 1$.
A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$
- If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$
- Use the given graph of the function f , find the value of x where $f'(x) = 0$.
A. $x = -2$ B. $x = 2$
C. $x = 0$ D. both (A and B)
- Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.
A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
- Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
A. $\begin{cases} (-3, 4) \\ (3, -4) \end{cases}$ B. $\begin{cases} (4, -3) \\ (-4, -3) \end{cases}$ C. $\begin{cases} (-4, 3) \\ (4, -3) \end{cases}$ D. $\begin{cases} (4, 3) \\ (-4, -3) \end{cases}$
- Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.
A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$
- Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x-1}$.
A. $y = -1$, $y = 2$ B. $y = -1$, $y = 0$ C. $y = 0$, $y = 2$ D. $y = 1$, $y = 0$
- Use the given graph of the function $y = f(x)$. Which of the following is false?
A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
C. $f''(2) < 0$ D. $f''(-1) < f''(3)$
- Find the point of inflection for $f(x) = x^3 + 3x^2$.
A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$
- The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.
A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2
- If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$.
Knowing that $f'(5) = 4$ and $g(-2) = 5$. A. 3 B. $\frac{5}{12}$ C. 7 D. 5
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$



27. Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
 A. -2 B. 2 C. 5 D. 10
28. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?
 A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
 C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$
29. If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is :
 A. 1 B. -1 C. 2 D. -2
30. Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
 A. -2 B. 1 C. 4 D. -4
31. Find the value of $\int \frac{2-3\cos x}{4} dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
 C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$
32. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$. A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$
33. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $-\frac{1}{6}$ C. $\frac{1}{6}$ D. 6
34. A man looks at a plane in the sky, at a horizontal distance of 600 m , with an inclination angle of 30° . What is the altitude of the plane?
 A. $600\sqrt{3}\text{ m}$ B. $200\sqrt{3}\text{ m}$ C. 200 m D. $600\sqrt{2}\text{ m}$
35. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.

36. Find the value of $\int_1^3 \ln 9x dx$.
 A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$
37. On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing ?
 A. $] -\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$
38. The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$.
 Find the distance between the point B and the line $x - 3y = -14$.
 A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$
- 

39. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$

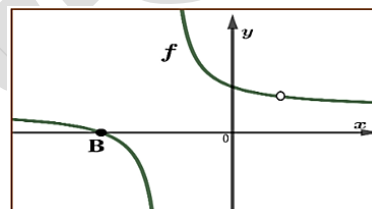
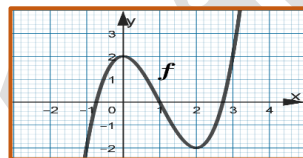


40. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$. A. 1 B. 0 C. 2 D. $\frac{1}{2}$
41. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
 A. 12 m/s^2 B. 6 m/s^2 C. 18 m/s^2 D. 0 m/s^2
42. The graph on the right shows the graph of f , determine the graph of its derivative.

43. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0
44. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
 A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
45. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0
46. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
 A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$
47. For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12
48. Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$
49. Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$. A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$
50. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.
 A. $b = 1$ B. $b = 0$
 C. $b = 3$ D. $b = 4$
- 



Choose the correct answer, two marks for each question

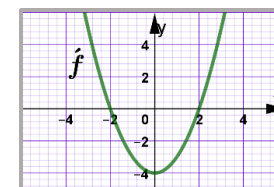
- A man looks at a plane in the sky , at a horizontal distance of 600 m , with an inclination angle of 30° . What is the altitude of the plane?
 A. $600\sqrt{3} \text{ m}$ B. $200\sqrt{3} \text{ m}$ C. 200 m D. $600\sqrt{2} \text{ m}$
- On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing ?
 A. $] -\infty , 0[$ B. $] 2 , +\infty[$ C. $] 0 , 4[$ D. $] 0 , 2[$
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$. A. 1 B. 0 C. -1 D. $\frac{1}{2}$
- If $f(x) = x\sqrt{x}$, find the value of $f'(1)$. A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$
- What is the domain of the function $f(x) = \sqrt{4-x^2}$?
 A. $] -\infty , -2] \cup [2 , +\infty[$ B. $\mathbb{R}$ C. $] -2 , 2[$ D. $[-2 , 2]$
- Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$
- Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.
 A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
- Use the given graph of the function $y = f(x)$.Which of the following is false?
 A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$
- If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is :
 A. 1 B. -1 C. 2 D. -2
- The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$
 Find the distance between the point **B** and the line $x - 3y = -14$.
 A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$
- Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
 A. $] 0 , 2[$ B. $] 2 , +\infty[$ C. $] 0 , +\infty[$ D. $] -\infty , 0[$
- Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
 A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$



13. The graph on the right shows the graph of the function f' .

On which interval is the function f concave?

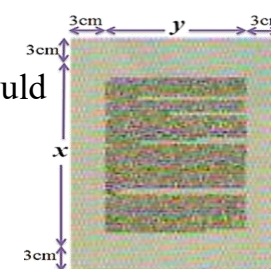
- A. $] -\infty , -2[$ B. $] 2 , +\infty[$
 C. $] -\infty , -2[\cup] 2 , +\infty[$ D. $] 0 , +\infty[$

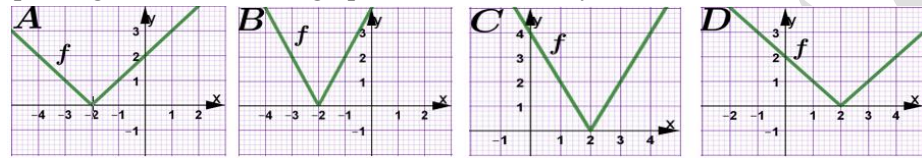


14. Which of the following function is odd ? A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$
 C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$
15. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$. A. 1 B. 0 C. 2 D. $\frac{1}{2}$
16. Find the value for the multiplication of $f''(2) g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
 A. -2 B. 1 C. 4 D. -4
17. Use the given graph on the right, which of the following is false?
 A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$
18. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.
 A. 12 m/s^2 B. 6 m/s^2 C. 18 m/s^2 D. 0 m/s^2
19. If $\int_{-1}^1 f(x)dx = 5$ and $\int_{-1}^1 h(x)dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)]dx$.
 A. 10 B. 21 C. 31 D. 35
20. Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.
 A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$
21. Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$
22. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.
 A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$
23. Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$. A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0
24. Find the point of inflection for $f(x) = x^3 + 3x^2$.
 A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$
25. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^x - 1}$.
 A. $y = -1$, $y = 2$ B. $y = -1$, $y = 0$ C. $y = 0$, $y = 2$ D. $y = 1$, $y = 0$

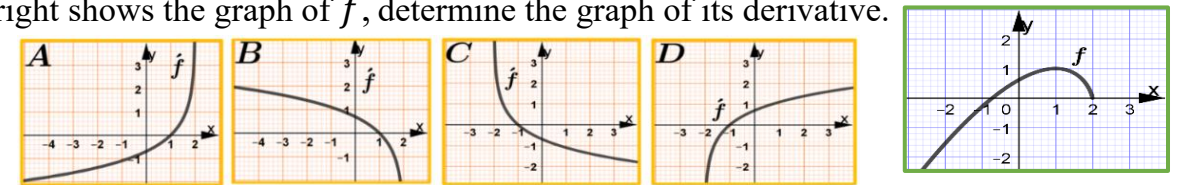
26. A graphic is designer is planning to design a rectangular page that should contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide . What should the dimensions of the page be so that the least amount of paper is used?

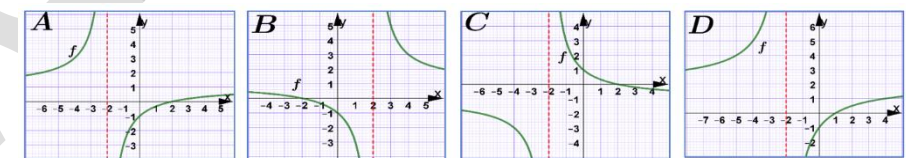
- A. $\begin{cases} \text{lenght} = 20 \text{ cm} \\ \text{width} = 18 \text{ cm} \end{cases}$ B. $\begin{cases} \text{lenght} = 23 \text{ cm} \\ \text{width} = 23 \text{ cm} \end{cases}$
 C. $\begin{cases} \text{lenght} = 17 \text{ cm} \\ \text{width} = 17 \text{ cm} \end{cases}$ D. $\begin{cases} \text{lenght} = 22 \text{ cm} \\ \text{width} = 22 \text{ cm} \end{cases}$



27. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.
 A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$
28. Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
 A. -2 B. 2 C. 5 D. 10
29. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0
30. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.
 A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
 C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$
31. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.
 A. 30 B. 10 C. $\frac{28}{3}$ D. 28
32. Find the value of a when $x = -1$ is being the vertical asymptote of function $f(x) = \frac{3x-15}{x^2+3x+a}$.
 A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$
33. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.
 A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
 C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$
34. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $\frac{-1}{6}$ C. $\frac{1}{6}$ D. 6
35. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?
 A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
 C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$
36. Use the given graph of the function f , find the value of x where $f'(x) = 0$.
 A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)
37. Use point-plotting to determine the graph of the function by $f(x) = |x - 2|$.

38. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?
 A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
 C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$
39. Find the value of $\int_1^3 \ln 9x \, dx$.
 A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$

40. The graph on the right shows the graph of f , determine the graph of its derivative.

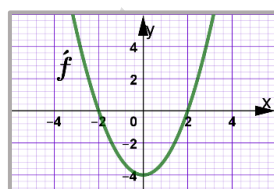
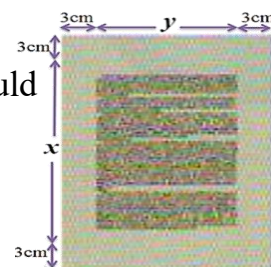


41. Find the value of $\int \frac{2-3\cos x}{4} \, dx$. A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
 C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$
42. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$.

43. Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$. A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$
44. The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.
 A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2
45. Use the intermediate value theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2 ?
 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
46. If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$ knowing that $f'(5) = 4$ and $g(-2) = 5$.
 A. 3 B. $\frac{5}{12}$ C. 7 D. 5
47. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.
 A. $b = 1$ B. $b = 0$
 C. $b = 3$ D. $b = 4$
48. For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12
49. Find the value of $\int_1^2 \int (\frac{3}{x^2} - 2) \, dx$. A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$
50. Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.
 A. $\{(-3, 4), (3, -4)\}$ B. $\{(4, -3), (-4, -3)\}$ C. $\{(-4, 3), (4, -3)\}$ D. $\{(4, 3), (-4, -3)\}$



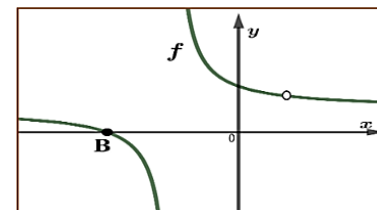
Choose the correct answer, two marks for each question

- Find the area of the region bound by the graph of the function $f(x) = e^x + 2$, the x -axis and the two lines $x = 0$ and $x = 2$.
 A. $3 + e^2$ B. $4 + e^2$ C. e^2 D. $2 + e^2$
- Find the value of $\int \frac{2-3\cos x}{4} dx$.
 A. $\frac{1}{4}(2x - 3\sin x) + c$ B. $\frac{1}{4}(2 - 3\sin x) + c$
 C. $2x + 3\sin x + c$ D. $2x - 3\sin x + c$
- Find the value for the multiplication of $f''(2)g(-2)$, when $f(x) = 3 - x^2$ and $g(x) = 2x + 5$
 A. -2 B. 1 C. 4 D. -4
- Find b so that the points $(3, 5)$, $(b, 0)$ and $(-4, 10)$ are collinear.
 A. -2 B. 2 C. 5 D. 10
- A graphic is designer is planning to design a rectangular page that should contain 289 cm^2 of print. Each of the four margins is to be 3 cm wide. What should the dimensions of the page be so that the least amount of paper is used?
 A. {length = 20 cm, width = 18 cm} B. {length = 23 cm, width = 23 cm}
 C. {length = 17 cm, width = 17 cm} D. {length = 22 cm, width = 22 cm}
- The graph on the right shows the graph of the function f' .
 On which interval is the function f concave?
 A. $]-\infty, -2[$ B. $]2, +\infty[$
 C. $]-\infty, -2[\cup]2, +\infty[$ D. $]0, +\infty[$
- Find the point of inflection for $f(x) = x^3 + 3x^2$.
 A. $(2, -1)$ B. $(-1, 2)$ C. $(1, 4)$ D. $(-1, 4)$
- Over which interval does the function $f(x) = \frac{2}{\sqrt{x}}$ have a point of discontinuity?
 A. $]0, 2[$ B. $]2, +\infty[$ C. $]0, +\infty[$ D. $]-\infty, 0[$
- Use the intermediate vale theorem (IVT), Which of the following functions where $f(x) = 0$ has a root between 0 and 2 ?
 A. $f(x) = \frac{4}{3-3x}$ B. $f(x) = \frac{-4}{x+1}$ C. $f(x) = \frac{1-3x}{x+2}$ D. $f(x) = \frac{2x+1}{x-1}$
- Find the value of k if the function $f(x) = 2 - kx$ have an intersection point with the function $g(x) = x + 2$ at $x = 1$.
 A. $k = -1$ B. $k = -6$ C. $k = 1$ D. $k = 6$
- If $f(x) = x\sqrt{x}$, find the value of $f'(1)$.
 A. $\frac{1}{3}$ B. 2 C. $\frac{3}{2}$ D. $\frac{2}{3}$
- If $f(x) = 2x - 1 + \cos(2x)$, then the value of $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is :
 A. 1 B. -1 C. 2 D. -2

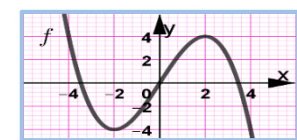


- The tangent line to the graph of a function h at the point $(3, 6)$ passes through the point $(-1, 4)$. Find the value of $h'(3)$.
 A. 2 B. $\frac{1}{2}$ C. $-\frac{1}{2}$ D. -2

- The figure on the right shows the graph of the function $f(x) = \frac{x^2+2x-8}{x^2-4}$. Find the distance between the point B and the line $x - 3y = -14$.
 A. 10 B. $\frac{18}{\sqrt{10}}$
 C. $\sqrt{10}$ D. $\frac{4}{\sqrt{10}}$



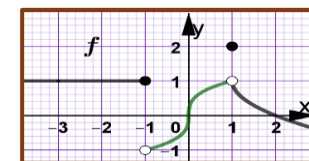
- Find the value of $\lim_{x \rightarrow 0} \frac{\sin 2x + \sin 3x}{4x}$.
 A. $\frac{4}{5}$ B. $\frac{1}{2}$ C. $\frac{5}{4}$ D. 0
- Find the equation of a line passing through the points $(0, 2)$ and $(-3, 0)$.
 A. $\frac{x}{3} - \frac{y}{2} = 1$ B. $\frac{x}{3} + \frac{y}{2} = -1$ C. $\frac{x}{2} + \frac{y}{3} = 1$ D. $\frac{-x}{3} + \frac{y}{2} = 1$
- Use the given graph of the function f , find the value of x where $f'(x) = 0$.
 A. $x = -2$ B. $x = 2$
 C. $x = 0$ D. both (A and B)



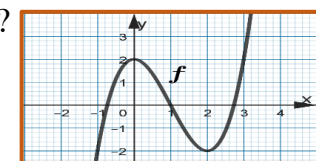
- Find the value of $\int_1^3 \ln 9x dx$.
 A. $\ln 9x - 2$ B. $9\ln 3x - 2$ C. $7\ln 3x + 2$ D. $7\ln 3x - 2$

- Use the given graph on the right, which of the following is false?

- A. $\lim_{x \rightarrow 1^-} f(x) = 1$ B. $\lim_{x \rightarrow 2} f(x) = 0$
 C. $\lim_{x \rightarrow -1^+} f(x) = -1$ D. $\lim_{x \rightarrow 1} f(x) = f(1)$



- If f and g are two differentiable functions and $(f \circ g)'(-2) = 12$, find the value of $g'(-2)$.
 Knowing that $f'(5) = 4$ and $g(-2) = 5$.
 A. 3 B. $\frac{5}{12}$ C. 7 D. 5
- On which interval is the function $f(x) = e^{(x^3-3x^2)}$ decreasing ?
 A. $]-\infty, 0[$ B. $]2, +\infty[$ C. $]0, 4[$ D. $]0, 2[$
- Find the value of $\int_1^2 \int (\frac{3}{x^2} - 2) dx$.
 A. $\frac{1}{2}$ B. $\frac{-21}{2}$ C. $\frac{-1}{2}$ D. $\frac{21}{2}$
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} |x| \cos \frac{1}{x^2}$.
 A. 1 B. 0 C. -1 D. $\frac{1}{2}$
- Assume that x and y are two differentiable functions of a variable t . If $y = \sqrt{x+5}$ then find the value of $\frac{dx}{dt}$ when $x = 4$, given that $\frac{dy}{dt} = \frac{1}{3}$.
 A. 2 B. 3 C. $\frac{1}{2}$ D. $\frac{1}{6}$
- For what value of b , does the function $f(x) = \begin{cases} \frac{2x^2-3x-9}{x-3} & x \neq 3 \\ bx-3 & x = 3 \end{cases}$ have no points of discontinuity?
 A. 3 B. 4 C. 6 D. 12
- Use the given graph of the function $y = f(x)$. Which of the following is false?
 A. $f'(1) < 0$ B. $f'(0) + f''(1) = 0$
 C. $f''(2) < 0$ D. $f''(-1) < f''(3)$



27. If $f(x) = \frac{2}{(1-x)^3}$ then find the value of $\lim_{x \rightarrow 1^+} f(x)$. A. $-\infty$ B. $+\infty$ C. -1 D. 0

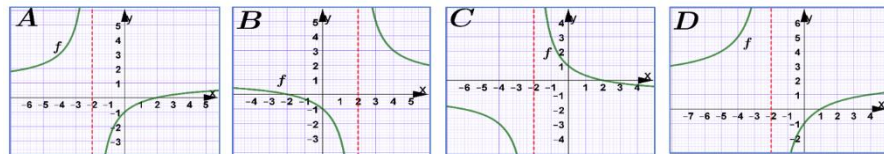
28. Find the slant asymptote to the graph of the function $f(x) = \frac{-x^2+3x-1}{x-1}$.
A. $y = x + 2$ B. $y = -x + 2$ C. $y = x - 2$ D. $y = -x - 2$

29. Find the x -intercepts of the graph of the function $f(x) = (x+2)\sqrt{4+x^2}$.
A. $(0, 2)$ B. $(2, 0)$ C. $(-2, 0)$ D. $(0, 4)$

30. Find the result of $\lim_{x \rightarrow 3} \frac{\sqrt{x+6}-3}{x-3}$. A. 0 B. $\frac{-1}{6}$ C. $\frac{1}{6}$ D. 6

31. Find the equation of the tangent line to the graph of the function $f(x) = x^2 - 2x - 3$ at the point $(-1, 0)$.
A. $y = -4x - 4$ B. $y = -4x + 1$ C. $y = 4x - 4$ D. $y = 4x + 3$

32. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{x-2}{x+2}$



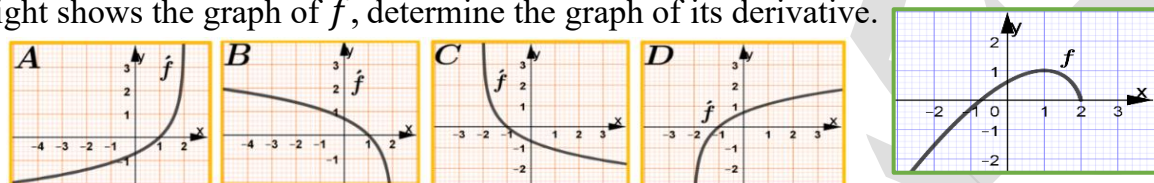
33. For which of the following functions the vertical asymptotes are $x = 1$ and $x = 2$?

A. $f(x) = \frac{x^2+x-6}{x^2-3x-2}$ B. $f(x) = \frac{x^2+x-6}{x^2-3x+2}$
C. $f(x) = \frac{x^2-x-6}{x^2-3x+2}$ D. $f(x) = \frac{x^2+x-2}{x^2-3x-2}$

34. If $f'(x) = 2x - 3$, find the function $f(x)$. Knowing that $f(-2) = 1$.

A. $f(x) = x^2 - 3x + 1$ B. $f(x) = x^2 - 3x - 9$
C. $f(x) = 2x^2 - 3x + 1$ D. $f(x) = x^2 - 3x$

35. The graph on the right shows the graph of f , determine the graph of its derivative.



36. Find the value of $\lim_{x \rightarrow 0} \frac{\tan 2x}{x}$. A. 1 B. 0 C. 2 D. $\frac{1}{2}$

37. An object moves according to the position function $S(t) = t^3 - 3t^2 - 9t$, t is measured in second and S in meters. Find the acceleration of the object when the velocity is zero.

A. 12 m/s^2 B. 6 m/s^2 C. 18 m/s^2 D. 0 m/s^2

38. Find points on the circle $x^2 + y^2 = 25$ where the tangent has a slope of $\frac{4}{3}$.

A. $\left\{ \begin{pmatrix} -3 \\ 4 \end{pmatrix} \right\}$ B. $\left\{ \begin{pmatrix} 4 \\ -3 \end{pmatrix} \right\}$ C. $\left\{ \begin{pmatrix} -4 \\ 3 \end{pmatrix} \right\}$ D. $\left\{ \begin{pmatrix} 4 \\ 3 \end{pmatrix} \right\}$

39. Which of the following function is odd? A. $f(x) = \frac{x}{|x-1|-|x+1|}$ B. $f(x) = x^2 + \sin x$

C. $f(x) = x^2 \cos x$ D. $f(x) = \frac{3}{x}$

40. If $\int_{-1}^1 f(x) dx = 5$ and $\int_{-1}^1 h(x) dx = 7$, find the result of $\int_{-1}^1 [2f(x) + 3h(x)] dx$.

A. 10 B. 21 C. 31 D. 35

41. Use L'Hôpital's rule to find the result of $\lim_{x \rightarrow -\infty} \frac{3x^2+5}{2x^2+1}$. A. $-\infty$ B. $+\infty$ C. $-\frac{3}{2}$ D. $\frac{3}{2}$

42. A man looks at a plane in the sky, at a horizontal distance of 600 m , with an inclination angle of 30° . What is the altitude of the plane?

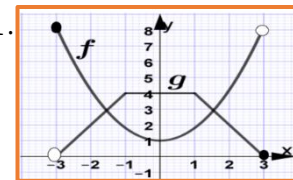
A. $600\sqrt{3} \text{ m}$ B. $200\sqrt{3} \text{ m}$ C. 200 m D. $600\sqrt{2} \text{ m}$

43. Find the value of a when $x = -1$ is being the vertical asymptote of

function $f(x) = \frac{3x-15}{x^2+3x+a}$. A. $a = -1$ B. $a = 2$ C. $a = -2$ D. $a = 1$

44. Use the given graph to find the value of b if you know that $f(g(b)) = 1$.

A. $b = 1$ B. $b = 0$
C. $b = 3$ D. $b = 4$



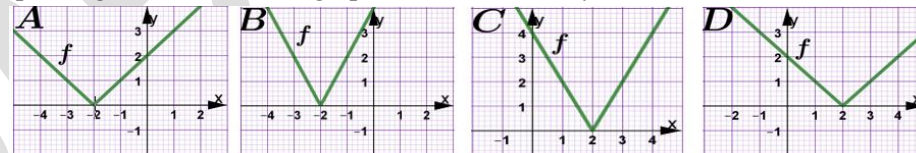
45. What is the domain of the function $f(x) = \sqrt{4-x^2}$?

A. $]-\infty, -2] \cup [2, +\infty[$ B. R C. $]-2, 2[$ D. $[-2, 2]$

46. Find the mean value of the function $f(x) = 3x^2 + 1$ over the interval $[0, 3]$.

A. 30 B. 10 C. $\frac{28}{3}$ D. 28

47. Use point-plotting to determine the graph of the function by $f(x) = |x-2|$.



48. If a function f is differentiable at $x = -4$, which of the following is equal to $f'(-4)$?

A. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x+4}$ B. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x-4}$
C. $\lim_{x \rightarrow 0} \frac{f(x) - f(-4)}{x-4}$ D. $\lim_{x \rightarrow -4} \frac{f(x) - f(-4)}{x+4}$

49. Determine the two functions of the following that match at all value of x with the exception of $x = 1$.

A. $f(x) = \frac{x^2-1}{x+1}$, $g(x) = x + 1$ B. $f(x) = \frac{x-1}{\sqrt{x}-1}$, $g(x) = \sqrt{x} + 1$
C. $f(x) = \frac{x^3-1}{x-1}$, $g(x) = x^2 - x + 1$ D. $f(x) = \frac{x^2-4}{x-2}$, $g(x) = x - 2$

50. Find the horizontal asymptotes to the graph of the function $f(x) = \frac{2e^{x+1}}{e^{x-1}}$.

A. $y = -1$, $y = 2$ B. $y = -1$, $y = 0$ C. $y = 0$, $y = 2$ D. $y = 1$, $y = 0$