

SN: 000001

Fingerprint

A

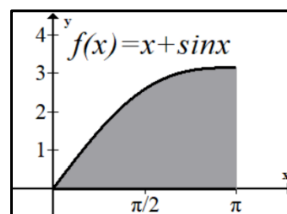
Choose the correct option. (2 marks for each question)

- Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$
A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$
- Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$
A) -3 B) 3 C) -2 D) 2
- Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$
A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$
- Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$
C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
- Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$
A) $]-\infty, 2]$ B) $[2, +\infty[$ C) $[-2, +\infty[$ D) $\mathbb{R}$
- Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
- At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection?
A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None
- $f(x) = x^2 + x - 2$ Which of the following equals $f(t-1)$
A) $(t-1)^2$ B) $(t-1)(t+2)$ C) $(t-2)(t+1)$ D) None of them
- Find the range of the function $f(x) = \frac{1}{|x+3|}$
A) $\mathbb{R} - \{0\}$ B) $\mathbb{R} - \{-3\}$ C) $]0, +\infty[$ D) $\mathbb{R}$
- Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2-bx+5}{x-1}$ are intersected at $x = -2$
A) 2 B) $\frac{-9}{4}$ C) $\frac{9}{4}$ D) None of them
- What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$
A) The function tends to $+\infty$ B) The function tends to $-\infty$
C) The function tends to -2 D) The function tends to 0
- Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$
A) $\frac{5}{2}$ B) 2 C) 6 D) 1
- Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$
A) 3 B) 2 C) -1 D) -2
- Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$
A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$

- If $e^y = -\sin x$, find y'
A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$
- Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$
A) $-\infty$ B) $+\infty$ C) -2 D) 2
- Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$
A) 3 B) 0 C) 4 D) 2
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$
A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$
- Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.
A) 3 B) 1 C) 2 D) -2
- Find the third derivative of the function $f(x) = x \ln x$
A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$
- Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$
A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$
- Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x}-1}{\ln(x+1)}$ (Use L'Hôpital's rule)
A) 3 B) e C) -1 D) 1
- $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$
A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2
- Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$
- Which of the following functions is symmetric with respect the origin?
A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x+3}$
- If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
A) -1 B) -2 C) 3 D) Does not exist
- What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2
- Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$
A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$
- A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2-x-1}{x-1}$
A) $x = 2, y = x + 1$ B) $x = 1, y = -x + 1$
C) $x = -1, y = 2x - 1$ D) $x = 1, y = -(x + 2)$

31. Find the area of the shaded region where $f(x) = x + \sin x$

- A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
 C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$



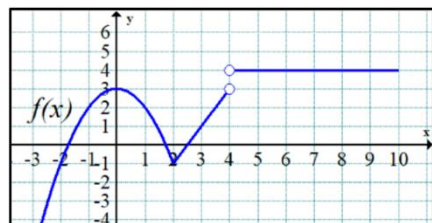
32. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, -\frac{1}{2})$ then find $f'(0)$?

- A) 6 B) $\frac{7}{4}$ C) $-\frac{1}{2}$ D) $\frac{3}{2}$

33. Use the given graph on the right, to find

the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$

- A) 4 B) -2
 C) 1 D) 3



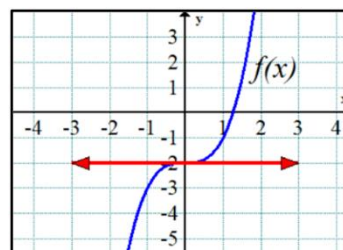
34. Which of the following is true?

- A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
 B) If $f(a) = f(b)$ then $a = b$
 C) If f is a rational function then it has at least one vertical asymptote.
 D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$

35. The figure on the right shows the graph of a function $f(x)$

Which of the following is true ?

- A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
 C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$



36. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$

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

37. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

- A) $]0, \frac{5\pi}{3}[$ B) $]\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $]\frac{4\pi}{3}, 2\pi[$

38. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100

- A) 1750 B) 1000 C) 1500 D) 1250

39. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x+1}$

- A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None

40. The result of $\int_0^2 x e^x dx$ is :

- A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$

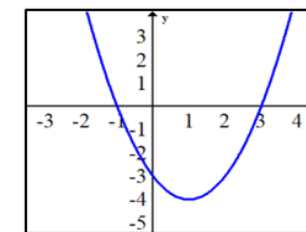
41. If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$

- A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$

42. The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$

43. The figure on the right shows the graph of the derivative of the function f . which of the following is true ?

- A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
 C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$



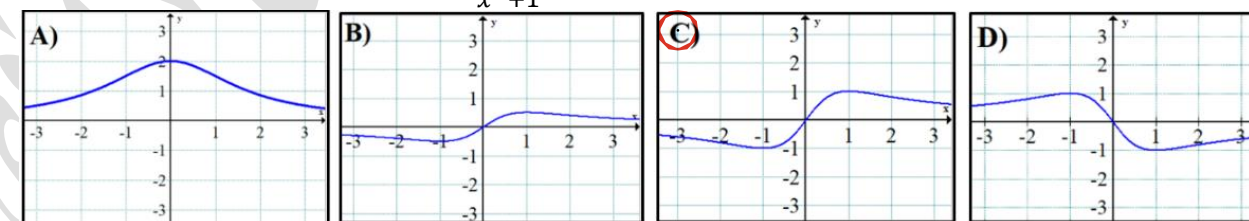
44. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$

- A) -2 B) 2 C) 4 D) -3

45. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point $(2, 10)$

- A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
 C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$

46. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2+1}$

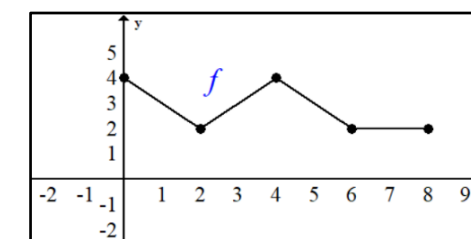


47. Find the result of $\int \left(\frac{1+\sin 2x}{\cos x + \sin x} \right) dx$

- A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
 C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$

48. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

- A) $\frac{11}{4}$ B) 22
 C) $\frac{11}{8}$ D) $\frac{9}{4}$



49. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :

- A) $x^2 + 2\tan x + c$ B) $x^2 - 2\tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2\tan x + c$

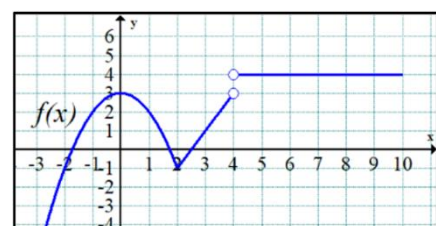
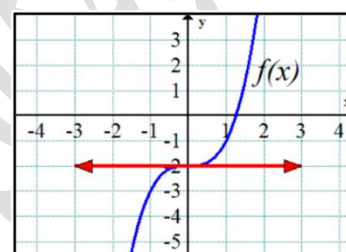
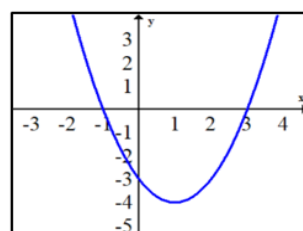
50. Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$

- A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$



Choose the correct option. (2 marks for each question)

- Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$
A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
- Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)
A) 3 B) e C) -1 D) 1
- Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
A) $f(x) = \frac{x^2 - 16}{2x - 4}$ B) $f(x) = \frac{4x - 16}{4x^2 - 8}$
C) $f(x) = \begin{cases} \frac{x^2 - 4}{4 - 2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2 - 16}{4 - 2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
- Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x - 1}$ are intersected at $x = -2$
A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them
- The figure on the right shows the graph of the derivative of the function f . which of the following is true ?
A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$
- Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)
A) $F(x) = \frac{(10 - 4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10 - 4x^2)^3}{12} - 28$
C) $F(x) = \frac{-(10 - 4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10 - 4x^2)^3}{12} - 8$
- Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$ A) $\frac{5}{2}$ B) 2 C) 6 D) 1
- The figure on the right shows the graph of a function $f(x)$. Which of the following is true ?
A) $f''(0) < f''(1)$ B) $f'(0) < f'(-1)$
C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$
- Use the given graph on the right, to find the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$
A) 4 B) -2
C) 1 D) 3



- A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
- Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$
A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$
- $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$
A) $(t - 1)^2$ B) $(t - 1)(t + 2)$ C) $(t - 2)(t + 1)$ D) None of them
- Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1} - 1}$ A) 3 B) 2 C) -1 D) -2
- Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2
- Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.
A) 3 B) 1 C) 2 D) -2
- The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :
A) $x^2 + 2\tan x + c$ B) $x^2 - 2\tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2\tan x + c$
- Find the range of the function $f(x) = \frac{1}{|x+3|}$
A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R
- $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$
A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2
- What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2
- Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$
- Which of the following is false for the function $f(x) = \begin{cases} 2x + 1 & -1 < x < 2 \\ 3 & x = 2 \\ 1 + x^2 & 2 < x < 4 \end{cases}$
A) $\lim_{x \rightarrow 2^-} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$
- If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$
A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$
- Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$
A) -2 B) 2 C) 4 D) -3
- Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$
- Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$
A) -3 B) 3 C) -2 D) 2

26. Which of the following is true?

A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$

B) If $f(a) = f(b)$ then $a = b$

C) If f is a rational function then it has at least one vertical asymptote.

D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$

27. The result of $\int_0^2 x e^x dx$ is :

A) e^2

B) $e^2 - 1$

C) $e^2 + 1$

D) $\frac{e^2}{2} + 2$

28. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$

A) $-\infty$

B) $+\infty$

C) -2

D) 2

29. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$

A) 2

B) $\frac{1}{4}$

C) -2

D) $\frac{1}{2}$

30. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$

A) The function tends to $+\infty$

B) The function tends to $-\infty$

C) The function tends to -2

D) The function tends to 0

31. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$

A) $y = x + \pi$

B) $y = -x - 1 + \pi$

C) $y = x + 1 + \pi$

D) $y = x - \pi$

32. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

A) $f(x) = (x-3)(x^2+4)$

B) $f(x) = (x+3)(x^2+4)$

C) $f(x) = (x-3)(x^2-4)$

D) $f(x) = (x-4)(x-3)$

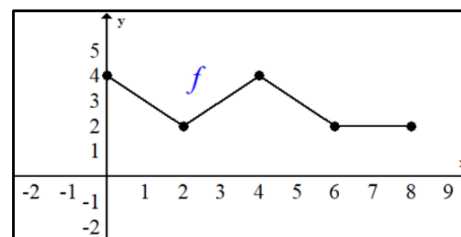
33. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

A) $\frac{11}{4}$

B) 22

C) $\frac{11}{8}$

D) $\frac{9}{4}$



34. Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$

A) $F'(x) = 8 - x \sqrt[3]{x}$

B) $F'(x) = x \sqrt[3]{x}$

C) $F'(x) = -x \sqrt[3]{x}$

D) $F'(x) = x \sqrt[3]{x} - 8$

35. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100

A) 1750

B) 1000

C) 1500

D) 1250

36. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$

A) -1

B) -2

C) 3

D) Does not exist

37. Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1

A) 15

B) $\frac{17}{16}$

C) $\frac{9}{5}$

D) $\frac{7}{15}$

38. Find the third derivative of the function $f(x) = x \ln x$

A) $\frac{1}{x}$

B) $\frac{2}{x^2}$

C) $\frac{-2}{x^2}$

D) $\frac{-1}{x^2}$

39. If $e^y = -\sin x$, find y'

A) $y' = \tan x$

B) $y' = -\tan x$

C) $y' = \frac{1}{\tan x}$

D) $y' = \frac{-1}{\tan x}$

40. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$

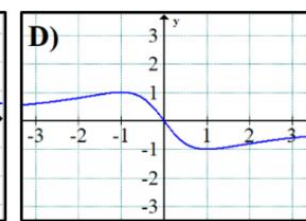
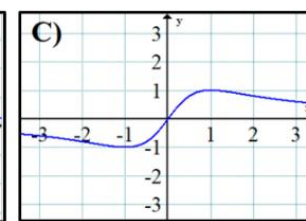
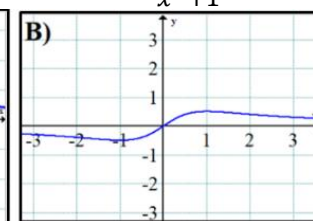
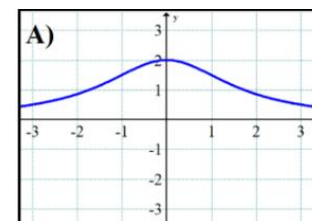
A) $]-\infty, 2]$

B) $[2, +\infty[$

C) $[-2, +\infty[$

D) R

41. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2+1}$



42. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection?

A) $x = 0$

B) $x = 1$

C) $x = 2$

D) None

43. Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$

A) $\sin x + \cos x + c$

B) $-\sin x - \cos x + c$

C) $\sin x - \cos x + c$

D) $\ln |\cos x + \sin x| + c$

44. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$

A) $\frac{\sin x}{2 + \cos^2 x}$

B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$

C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$

D) $\frac{-\sin 2x}{2 + \cos^2 x}$

45. Which of the following functions is symmetric with respect the origin?

A) $f(x) = |x|$

B) $f(x) = \cos^3 x$

C) $f(x) = x \sin^2 x$

D) $f(x) = 1 - \sqrt{x+3}$

46. Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2-x-1}{x-1}$

A) $x = 2$, $y = x + 1$

B) $x = 1$, $y = -x + 1$

C) $x = -1$, $y = 2x - 1$

D) $x = 1$, $y = -(x + 2)$

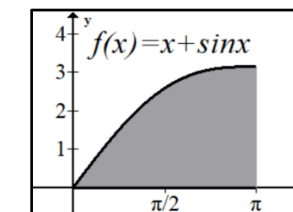
47. Find the area of the shaded region where $f(x) = x + \sin x$

A) $\pi^2 + 1$

B) $\frac{\pi^2}{2} + 1$

C) $\frac{\pi^2+4}{2}$

D) $\frac{\pi^2}{2}$



48. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?

A) 6

B) $\frac{7}{4}$

C) $\frac{-1}{2}$

D) $\frac{3}{2}$

49. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

A) $]0, \frac{5\pi}{3}[$

B) $]\frac{2\pi}{3}, \frac{4\pi}{3}[$

C) $]0, \frac{2\pi}{3}[$

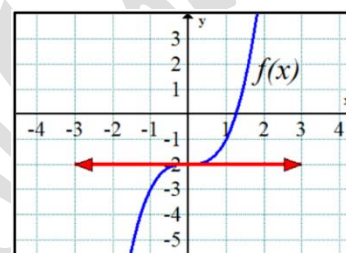
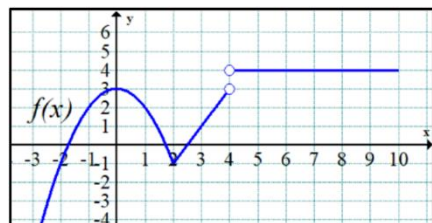
D) $]\frac{4\pi}{3}, 2\pi[$

50. The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$

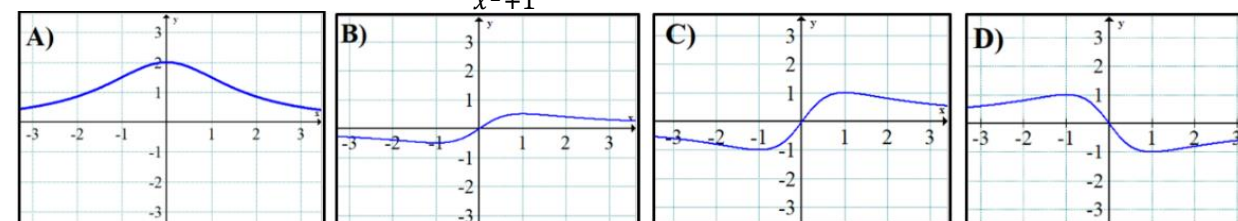
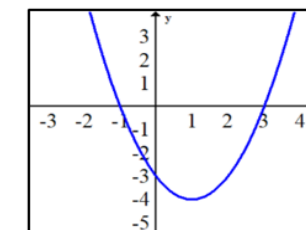


Choose the correct option. (2 marks for each question)

- Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$
A) -3 B) 3 C) -2 D) 2
- Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$
A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
- The result of $\int_0^2 xe^x dx$ is :
A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$
- Use the given graph on the right, to find the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$
A) 4 B) -2 C) 1 D) 3
- Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point $(2, 10)$
A) $F(x) = \frac{(10 - 4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10 - 4x^2)^3}{12} - 28$
C) $F(x) = \frac{-(10 - 4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10 - 4x^2)^3}{12} - 8$
- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x - 1}$
A) $x = 2, y = x + 1$ B) $x = 1, y = -x + 1$
C) $x = -1, y = 2x - 1$ D) $x = 1, y = -(x + 2)$
- Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x + 1)}$ (Use L'Hôpital's rule)
A) 3 B) e C) -1 D) 1
- The figure on the right shows the graph of a function $f(x)$
Which of the following is true ?
A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$
- What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2
- Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x + 5}{(x - 3)^3}$
A) $-\infty$ B) $+\infty$ C) -2 D) 2
- Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$
find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3, y = 2$
A) -2 B) 2 C) 4 D) -3



- $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$
A) $(t - 1)^2$ B) $(t - 1)(t + 2)$ C) $(t - 2)(t + 1)$ D) None of them
- Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}, g(x) = 3x$ and $h(x) = x - 2$
A) $]-\infty, 2]$ B) $[2, +\infty[$ C) $[-2, +\infty[$ D) $\mathbb{R}$
- The figure on the right shows the graph of the derivative of the function f . which of the following is true ?
A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$
- Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
A) 1750 B) 1000 C) 1500 D) 1250
- If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, -\frac{1}{2})$ then find $f'(0)$?
A) 6 B) $\frac{7}{4}$ C) $-\frac{1}{2}$ D) $\frac{3}{2}$
- Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x, g(x) = \sqrt{x}$ and the line $y = 2x - 1$
A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$
- Which of the following is true?
A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
B) If $f(a) = f(b)$ then $a = b$
C) If f is a rational function then it has at least one vertical asymptote .
D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$
- Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2 + 1}$
A) B) C) D)
- A point moves on the x-axis .The function $S(t) = t^2 - 6t + 5$ is the position function of this point , t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
- The result of $\int_0^1 (x^2 + 1)^2 dx$ is :
A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$
- If $e^y = -\sin x$, find y'
A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x} - 2} \leq f(x) \leq \frac{x^2}{1 - \cos 2x}$
A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$



24. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?

- A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None

25. Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$

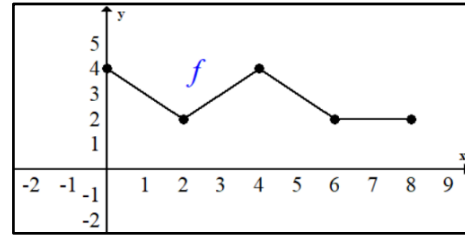
- A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$
 C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$

26. Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$

- A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$

27. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

- A) $\frac{11}{4}$ B) 22
 C) $\frac{11}{8}$ D) $\frac{9}{4}$



28. Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1

- A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$

29. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$

- A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$

30. Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$

- A) $\frac{5}{2}$ B) 2 C) 6 D) 1

31. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$

- A) -1 B) -2 C) 3 D) Does not exist

32. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

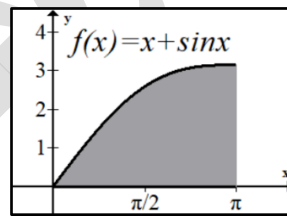
- A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
 C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$

33. Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$

- A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
 C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$

34. Find the area of the shaded region where $f(x) = x + \sin x$

- A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
 C) $\frac{\pi^2+4}{2}$ D) $\frac{\pi^2}{2}$



35. Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$

- A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$

36. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.

- A) 3 B) 1 C) 2 D) -2

37. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x-1}$ are intersected at $x = -2$

- A) 2 B) $\frac{-9}{4}$ C) $\frac{9}{4}$ D) None of them

38. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$

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

39. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$

- A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2

40. Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$

- A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$

41. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$

- A) 3 B) 0 C) 4 D) 2

42. Find the third derivative of the function $f(x) = x \ln x$

- A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$

43. Find the range of the function $f(x) = \frac{1}{|x+3|}$

- A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R

44. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$

- A) The function tends to $+\infty$ B) The function tends to $-\infty$
 C) The function tends to -2 D) The function tends to 0

45. Which of the following functions is symmetric with respect the origin ?

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

46. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$

- A) 3 B) 2 C) -1 D) -2

47. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :

- A) $x^2 + 2 \tan x + c$ B) $x^2 - 2 \tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2 \tan x + c$

48. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

- A) $]0, \frac{5\pi}{3}[$ B) $] \frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $] \frac{4\pi}{3}, 2\pi[$

49. If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$

- A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$

50. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$

- A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$



Choose the correct option. (2 marks for each question)

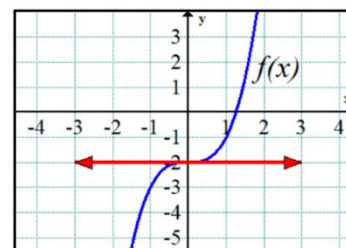
1. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

- A) $f(x) = (x - 3)(x^2 + 4)$ B) $f(x) = (x + 3)(x^2 + 4)$
C) $f(x) = (x - 3)(x^2 - 4)$ D) $f(x) = (x - 4)(x - 3)$

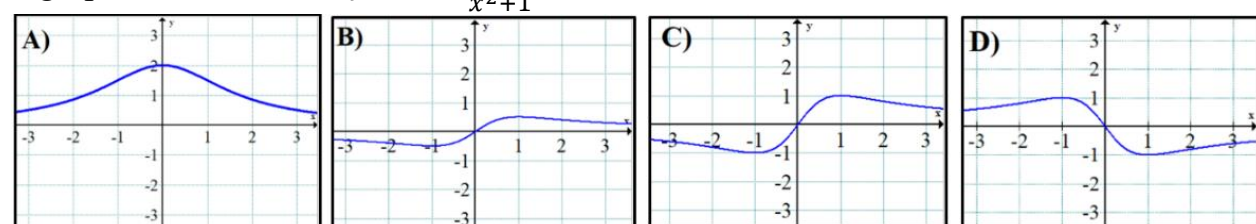
2. The figure on the right shows the graph of a function $f(x)$

Which of the following is true ?

- A) $f''(0) < f''(1)$ B) $f'(0) < f'(-1)$
C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$



3. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2 + 1}$



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

5. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$ A) 3 B) 2 C) -1 D) -2

6. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$

- A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$

7. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

- A) $]0, \frac{5\pi}{3}[$ B) $]\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $]\frac{4\pi}{3}, 2\pi[$

8. If $e^y = -\sin x$, find y'

- A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

9. Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$

- A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$

10. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?

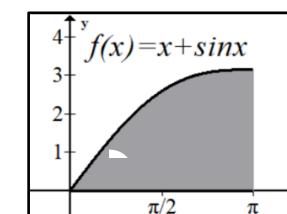
- A) 6 B) $\frac{7}{4}$ C) $\frac{-1}{2}$ D) $\frac{3}{2}$

11. Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x - 1}$

- A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x + 2)$

12. Find the area of the shaded region where $f(x) = x + \sin x$

- A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$

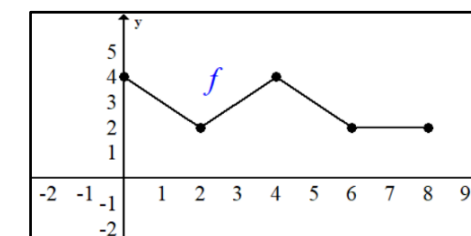


13. If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$

- A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$

14. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

- A) $\frac{11}{4}$ B) 22
C) $\frac{11}{8}$ D) $\frac{9}{4}$



15. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :

- A) $x^2 + 2 \tan x + c$ B) $x^2 - 2 \tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2 \tan x + c$

16. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$

- A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2

17. The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$

18. Which of the following is true?

- A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
B) If $f(a) = f(b)$ then $a = b$
C) If f is a rational function then it has at least one vertical asymptote.
D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$

19. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$

- A) The function tends to $+\infty$ B) The function tends to $-\infty$
C) The function tends to -2 D) The function tends to 0

20. Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$

- A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$

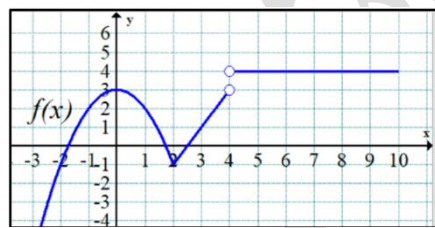
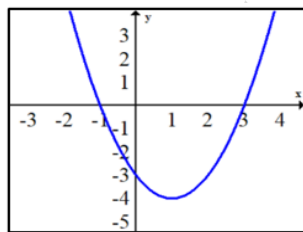
21. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)

- A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$

22. Which of the following is false for the function $f(x) = \begin{cases} 2x + 1 & -1 < x < 2 \\ 3 & x = 2 \\ 1 + x^2 & 2 < x < 4 \end{cases}$

- A) $\lim_{x \rightarrow 2^-} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$

23. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
 A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$
24. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?
 A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None
25. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
 A) 1750 B) 1000 C) 1500 D) 1250
26. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$
 A) -3 B) 3 C) -2 D) 2
27. A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
 A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
28. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$ A) $-\infty$ B) $+\infty$ C) -2 D) 2
29. Find the values of a and b if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
 A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$
30. Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x}-1}{\ln(x+1)}$ (Use L'Hôpital's rule)
 A) 3 B) e C) -1 D) 1
31. The result of $\int_0^2 xe^x dx$ is :
 A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$
32. The figure on the right shows the graph of the derivative of the function f . which of the following is true ?
 A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
 C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$
33. Find the range of the function $f(x) = \frac{1}{|x+3|}$
 A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R
34. Use the given graph on the right, to find the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$
 A) 4 B) -2
 C) 1 D) 3
35. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$
 A) $] -\infty, 2[$ B) $[2, +\infty[$ C) $[-2, +\infty[$ D) R
36. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$
 A) -2 B) 2 C) 4 D) -3
37. Find the equation of the tangent line to the graph of the curve $x + 1 = t \tan y$ at $y = \pi$
 A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$



38. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.
 A) 3 B) 1 C) 2 D) -2
39. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x - 1}$ are intersected at $x = -2$
 A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them
40. Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
 A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
41. Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
 A) $f(x) = \frac{x^2 - 16}{2x - 4}$ B) $f(x) = \frac{4x - 16}{4x^2 - 8}$
 C) $f(x) = \begin{cases} \frac{x^2 - 4}{4 - 2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2 - 16}{4 - 2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
42. Find the result of $\int (\frac{1 + \sin 2x}{\cos x + \sin x}) dx$
 A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
 C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$
43. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
 A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2
44. Find the third derivative of the function $f(x) = x \ln x$
 A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$
45. $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$
 A) $(t - 1)^2$ B) $(t - 1)(t + 2)$ C) $(t - 2)(t + 1)$ D) None of them
46. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$
 A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
47. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x} - 2} \leq f(x) \leq \frac{x^2}{1 - \cos 2x}$
 A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$
48. Which of the following functions is symmetric with respect the origin ?
 A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x + 3}$
49. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2
50. If $f(x) = \frac{-2x - 2}{|x + 1|}$ and $g(x) = \frac{|x + 1|}{x + 1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
 A) -1 B) -2 C) 3 D) Does not exist

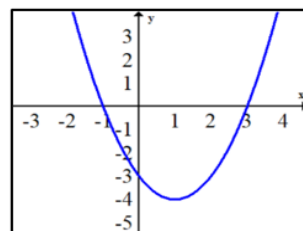
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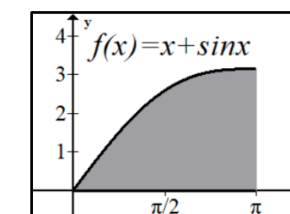
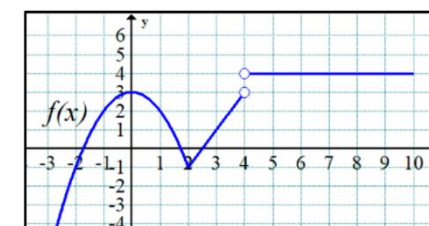
E

Choose the correct option. (2 marks for each question)

- Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$
 A) -3 B) 3 C) -2 D) 2
- Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
 A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
- Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
 A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$
 C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2-x-1}{x-1}$
 A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
 C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x + 2)$
- The figure on the right shows the graph of the derivative of the function f . which of the following is true ?
 A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
 C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$
- Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$
 A) $-\infty$ B) $+\infty$ C) -2 D) 2
- Find the third derivative of the function $f(x) = x \ln x$
 A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$
- Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$
 A) -2 B) 2 C) 4 D) -3
- $f(x) = x^2 + x - 2$ Which of the following equals $f(t-1)$
 A) $(t-1)^2$ B) $(t-1)(t+2)$ C) $(t-2)(t+1)$ D) None of them
- $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$
 A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2
- Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2-bx+5}{x-1}$ are intersected at $x = -2$
 A) 2 B) $\frac{-9}{4}$ C) $\frac{9}{4}$ D) None of them
- Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
 A) 1750 B) 1000 C) 1500 D) 1250

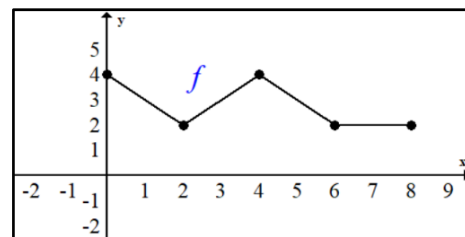


- Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$
 A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$
- What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$
 A) The function tends to $+\infty$ B) The function tends to $-\infty$
 C) The function tends to -2 D) The function tends to 0
- Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$
 A) 3 B) 0 C) 4 D) 2
- Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$
 A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$
- The result of $\int_0^2 x e^x dx$ is :
 A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$
- If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$
 A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$
- Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
 A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$
- Use the given graph on the right, to find the result of $\frac{f(-1) - 2 \lim_{x \rightarrow 4^+} f(x)}{f(0)}$
 A) 4 B) -2
 C) 1 D) 3
- Find the range of the function $f(x) = \frac{1}{|x+3|}$
 A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R
- At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?
 A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None
- Which of the following functions is symmetric with respect the origin ?
 A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x+3}$
- Find the area of the shaded region where $f(x) = x + \sin x$
 A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
 C) $\frac{\pi^2+4}{2}$ D) $\frac{\pi^2}{2}$
- If $e^y = -\sin x$, find y'
 A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$
- The result of $\int_0^1 (x^2 + 1)^2 dx$ is :
 A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$
- Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x}-1}{\ln(x+1)}$ (Use L'Hôpital's rule)
 A) 3 B) e C) -1 D) 1



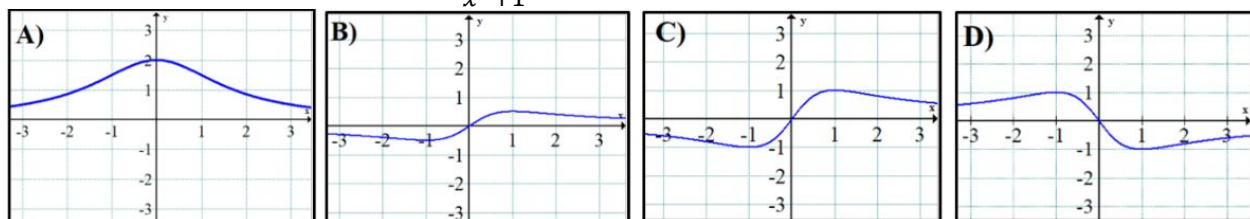
28. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

- A) $\frac{11}{4}$ B) 22
C) $\frac{11}{8}$ D) $\frac{9}{4}$



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

30. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2 + 1}$



31. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$ A) 3 B) 2 C) -1 D) -2

32. Find the result of $\int \left(\frac{1 + \sin 2x}{\cos x + \sin x} \right) dx$

- A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$

33. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
A) -1 B) -2 C) 3 D) Does not exist

34. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$
A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$

35. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$
A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None

36. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :

- A) $x^2 + 2 \tan x + c$ B) $x^2 - 2 \tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2 \tan x + c$

37. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

- A) $f(x) = (x - 3)(x^2 + 4)$ B) $f(x) = (x + 3)(x^2 + 4)$
C) $f(x) = (x - 3)(x^2 - 4)$ D) $f(x) = (x - 4)(x - 3)$

38. Find $F'(x)$ if $F(x) = \int_8^x t^3 \sqrt{t} dt$

- A) $F'(x) = 8 - x^3 \sqrt{x}$ B) $F'(x) = x^3 \sqrt{x}$ C) $F'(x) = -x^3 \sqrt{x}$ D) $F'(x) = x^3 \sqrt{x} - 8$

39. Which of the following is true?

A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$

B) If $f(a) = f(b)$ then $a = b$

C) If f is a rational function then it has at least one vertical asymptote.

D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$

40. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$

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

41. Which of the following is false for the function $f(x) = \begin{cases} 2x + 1 & -1 < x < 2 \\ 3 & x = 2 \\ 1 + x^2 & 2 < x < 4 \end{cases}$
A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$

42. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2, 10)

A) $F(x) = \frac{(10 - 4x^2)^3}{12} + 28$

B) $F(x) = \frac{(10 - 4x^2)^3}{12} - 28$

C) $F(x) = \frac{-(10 - 4x^2)^3}{12} + 8$

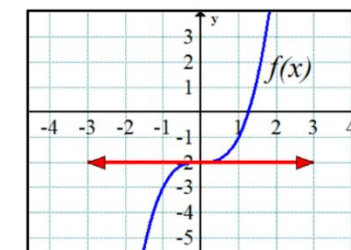
D) $F(x) = \frac{-(10 - 4x^2)^3}{12} - 8$

43. The figure on the right shows the graph of a function $f(x)$

Which of the following is true ?

A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$

C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$



44. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?

- A) 6 B) $\frac{7}{4}$ C) $\frac{-1}{2}$ D) $\frac{3}{2}$

45. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2

46. A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.

- A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s

47. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

- A) $]0, \frac{5\pi}{3}[$ B) $]\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $]\frac{4\pi}{3}, 2\pi[$

48. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.

- A) 3 B) 1 C) 2 D) -2

49. Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$

- A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$

50. Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$

- A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$

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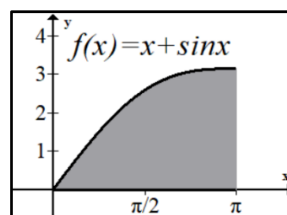
F

Choose the correct option. (2 marks for each question)

1. If $\int_a^b f(x)dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$
A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$

2. Find the area of the shaded region where $f(x) = x + \sin x$

- A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$



3. Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)

- A) 3 B) e C) -1 D) 1

4. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$

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

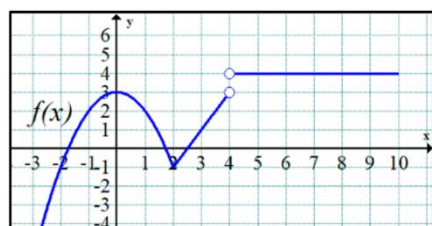
5. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.

- A) 3 B) 1 C) 2 D) -2

6. Use the given graph on the right, to find

the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$

- A) 4 B) -2
C) 1 D) 3



7. Which of the following is false for the function $f(x) = \begin{cases} 2x + 1 & -1 < x < 2 \\ 3 & x = 2 \\ 1 + x^2 & 2 < x < 4 \end{cases}$
A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$

8. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$

- A) -3 B) 3 C) -2 D) 2

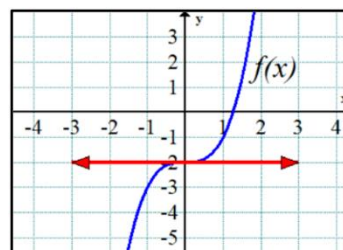
9. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

- A) $]0, \frac{5\pi}{3}[$ B) $]\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $]\frac{4\pi}{3}, 2\pi[$

10. The figure on the right shows the graph of a function $f(x)$

Which of the following is true ?

- A) $f''(0) < f''(1)$ B) $f'(0) < f'(-1)$
C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$



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

12. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$ A) 3 B) 2 C) -1 D) -2

13. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$
A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$

14. Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$

15. Find the range of the function $f(x) = \frac{1}{|x+3|}$
A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R

16. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$ A) $-\infty$ B) $+\infty$ C) -2 D) 2

17. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$
A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$

18. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$
A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2

19. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
A) 6 B) $\frac{7}{4}$ C) $\frac{-1}{2}$ D) $\frac{3}{2}$

20. If $e^y = -\sin x$, find y'
A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

21. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x-1}$ are intersected at $x = -2$
A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them

22. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :
A) $x^2 + 2\tan x + c$ B) $x^2 - 2\tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2\tan x + c$

23. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point $(2, 10)$

- A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$

24. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2

25. The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$

26. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$
A) -2 B) 2 C) 4 D) -3

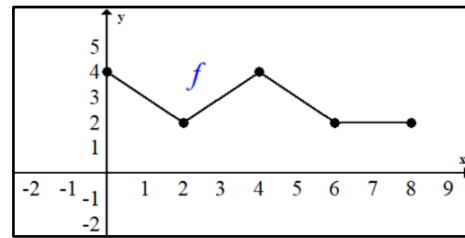
27. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
A) -1 B) -2 C) 3 D) Does not exist

28. Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2-x-1}{x-1}$

- A) $x = 2, y = x + 1$ B) $x = 1, y = -x + 1$
C) $x = -1, y = 2x - 1$ D) $x = 1, y = -(x + 2)$

29. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

- A) $\frac{11}{4}$ B) 22
C) $\frac{11}{8}$ D) $\frac{9}{4}$



30. Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$

- A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$

31. Find the derivative of the function $f(x) = \ln\sqrt{2 + \cos^2 x}$

- A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$

32. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$

- A) The function tends to $+\infty$ B) The function tends to $-\infty$
C) The function tends to -2 D) The function tends to 0

33. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}, g(x) = 3x$ and $h(x) = x - 2$

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

34. Which of the following is true?

- A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
B) If $f(a) = f(b)$ then $a = b$
C) If f is a rational function then it has at least one vertical asymptote.
D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$

35. Write the equation of the function whose x-intercepts are $x = 2, x = -2$ and $x = 3$

- A) $f(x) = (x - 3)(x^2 + 4)$ B) $f(x) = (x + 3)(x^2 + 4)$
C) $f(x) = (x - 3)(x^2 - 4)$ D) $f(x) = (x - 4)(x - 3)$

36. $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$

- A) $(t - 1)^2$ B) $(t - 1)(t + 2)$ C) $(t - 2)(t + 1)$ D) None of them

37. Find the third derivative of the function $f(x) = x \ln x$

- A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$

38. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$

- A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None

39. The result of $\int_0^2 x e^x dx$ is :

- A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$

40. Find the distance between the graph of the point of the intersection of the two functions

$f(x) = -x, g(x) = \sqrt{x}$ and the line $y = 2x - 1$

- A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$

41. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100

- A) 1750 B) 1000 C) 1500 D) 1250

42. Which of the following functions is symmetric with respect the origin ?

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

43. Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$

- A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$

44. Which of the following functions is discontinuous at $x = 2$ and it has a non-removable

- discontinuity at $x = 2$ A) $f(x) = \frac{x^2 - 16}{2x - 4}$ B) $f(x) = \frac{4x - 16}{4x^2 - 8}$
C) $f(x) = \begin{cases} \frac{x^2 - 4}{4 - 2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2 - 16}{4 - 2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$

45. Find the result of $\int \left(\frac{1 + \sin 2x}{\cos x + \sin x} \right) dx$

- A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$

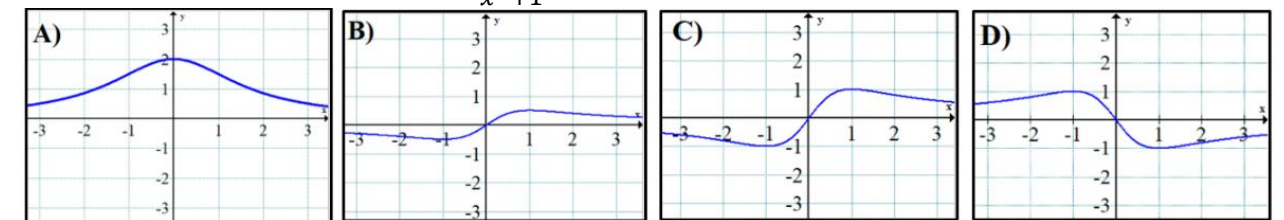
46. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?

- A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None

47. A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.

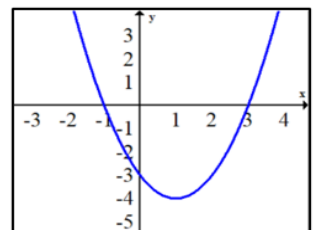
- A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s

48. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2 + 1}$



49. The figure on the right shows the graph of the derivative of the function f . which of the following is true ?

- A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$



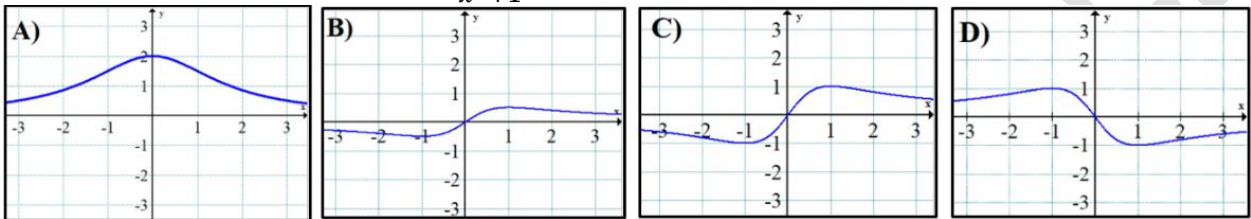
50. Find the result of $\lim_{x \rightarrow +\infty} \left(2 + \frac{\cos 2x}{x} \right)$ A) 3 B) 0 C) 4 D) 2

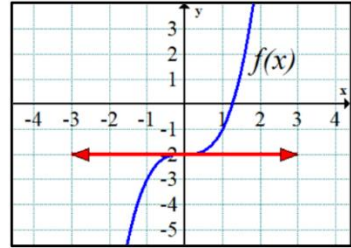
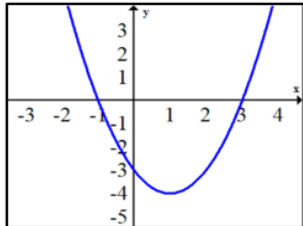
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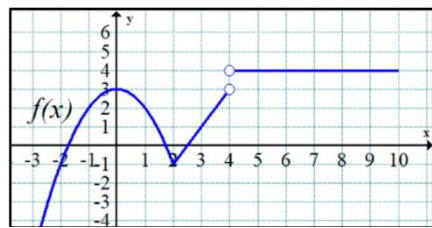
Choose the correct option. (2 marks for each question)

- $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$
 A) $(t - 1)^2$ B) $(t - 1)(t + 2)$ C) $(t - 2)(t + 1)$ D) None of them
- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x - 1}$
 A) $x = 2, y = x + 1$ B) $x = 1, y = -x + 1$
 C) $x = -1, y = 2x - 1$ D) $x = 1, y = -(x + 2)$
- Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x - 1}$ are intersected at $x = -2$
 A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them
- Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)
 A) $F(x) = \frac{(10 - 4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10 - 4x^2)^3}{12} - 28$
 C) $F(x) = \frac{-(10 - 4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10 - 4x^2)^3}{12} - 8$
- Which of the following is true?
 A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
 B) If $f(a) = f(b)$ then $a = b$
 C) If f is a rational function then it has at least one vertical asymptote.
 D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$
- Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2 + 1}$

- A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
 A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
- Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
 A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$
- Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3, y = 2$
 A) -2 B) 2 C) 4 D) -3

- Find the range of the function $f(x) = \frac{1}{|x+3|}$
 A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R
- Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x, g(x) = \sqrt{x}$ and the line $y = 2x - 1$
 A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$
- The result of $\int_0^1 (x^2 + 1)^2 dx$ is :
 A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$
- If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
 A) -1 B) -2 C) 3 D) Does not exist
- What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$
 A) The function tends to $+\infty$ B) The function tends to $-\infty$
 C) The function tends to -2 D) The function tends to 0
- $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$
 A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2
- Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$
 A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$
- The figure on the right shows the graph of a function $f(x)$ Which of the following is true ?

 A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
 C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$
- What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
 A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2
- Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$
 A) $\frac{5}{2}$ B) 2 C) 6 D) 1
- Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
 A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$
- Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
 A) $f(x) = \frac{x^2 - 16}{2x - 4}$ B) $f(x) = \frac{4x - 16}{4x^2 - 8}$
 C) $f(x) = \begin{cases} \frac{x^2 - 4}{4 - 2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2 - 16}{4 - 2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
- Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)
 A) 3 B) e C) -1 D) 1
- The figure on the right shows the graph of the derivative of the function f . which of the following is true ?

 A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
 C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$

24. Use the given graph on the right, to find

the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$



- A) 4 B) -2
C) 1 D) 3

25. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$

- A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None

26. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.

- A) 3 B) 1 C) 2 D) -2

27. Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$

- A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$

28. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$

- A) 3 B) 2 C) -1 D) -2

29. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100

- A) 1750 B) 1000 C) 1500 D) 1250

30. If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$

- A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$

31. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :

- A) $x^2 + 2\tan x + c$ B) $x^2 - 2\tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2\tan x + c$

32. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$

- A) $-\infty$ B) $+\infty$ C) -2 D) 2

33. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

- A) $]0, \frac{5\pi}{3}[$ B) $[\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $[\frac{4\pi}{3}, 2\pi[$

34. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$

- A) 3 B) 0 C) 4 D) 2

35. The result of $\int_0^2 x e^x dx$ is :

- A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$

36. Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a), (\frac{-2}{3}, \frac{4}{5})$ is -1

- A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$

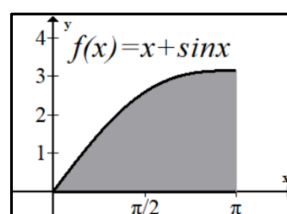
37. Which of the following functions is symmetric with respect the origin ?

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

38. Find the area of the shaded region where $f(x) = x + \sin x$

- A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$

- C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$



39. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$

- A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$

40. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?

- A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None

41. Find the third derivative of the function $f(x) = x \ln x$

- A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$

42. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

- A) $f(x) = (x - 3)(x^2 + 4)$ B) $f(x) = (x + 3)(x^2 + 4)$
C) $f(x) = (x - 3)(x^2 - 4)$ D) $f(x) = (x - 4)(x - 3)$

43. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$

- A) -3 B) 3 C) -2 D) 2

44. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$

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

45. If $e^y = -\sin x$, find y'

- A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

46. Which of the following is false for the function $f(x) = \begin{cases} 2x + 1 & -1 < x < 2 \\ 3 & x = 2 \\ 1 + x^2 & 2 < x < 4 \end{cases}$

- A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$

47. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?

- A) 6 B) $\frac{7}{4}$ C) $\frac{-1}{2}$ D) $\frac{3}{2}$

48. Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$

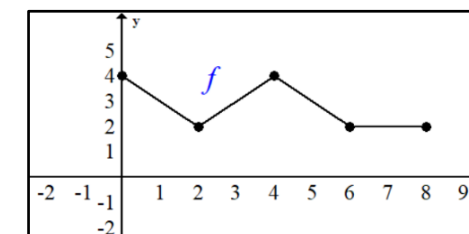
- A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$

49. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$

- A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$

50. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

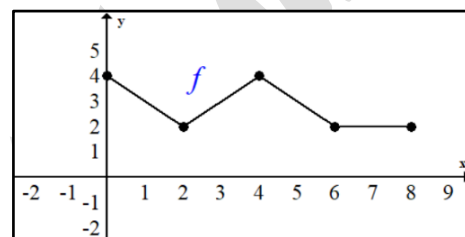
- A) $\frac{11}{4}$ B) 22
C) $\frac{11}{8}$ D) $\frac{9}{4}$



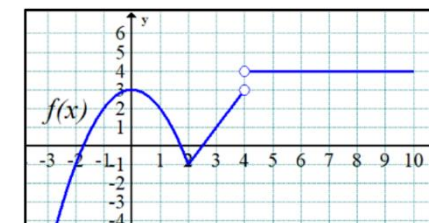


Choose the correct option. (2 marks for each question)

- Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$
 A) $f(x) = (x - 3)(x^2 + 4)$ B) $f(x) = (x + 3)(x^2 + 4)$
 C) $f(x) = (x - 3)(x^2 - 4)$ D) $f(x) = (x - 4)(x - 3)$
- $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$
 A) $(t - 1)^2$ B) $(t - 1)(t + 2)$ C) $(t - 2)(t + 1)$ D) None of them
- Find the range of the function $f(x) = \frac{1}{|x+3|}$
 A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R
- Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$
 A) $-\infty$ B) $+\infty$ C) -2 D) 2
- Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$
 find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$
 A) -2 B) 2 C) 4 D) -3
- Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
 A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$
- If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
 A) -1 B) -2 C) 3 D) Does not exist
- Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$
 A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$
- Which of the following functions is symmetric with respect the origin?
 A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x+3}$
- Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$
 A) $\frac{11}{4}$ B) 22
 C) $\frac{11}{8}$ D) $\frac{9}{4}$
- Find the result of $\int \left(\frac{1+\sin 2x}{\cos x + \sin x} \right) dx$
 A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
 C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$
- Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$
 A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$
- Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)
 A) 3 B) e C) -1 D) 1



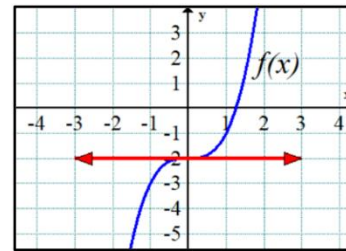
- Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$
 A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$
- The result of $\int_0^2 x e^x dx$ is:
 A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$
- Use the given graph on the right, to find the result of $\frac{f(-1) - 2 \lim_{x \rightarrow 4^+} f(x)}{f(0)}$
 A) 4 B) -2
 C) 1 D) 3
- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x - 1}$
 A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
 C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x + 2)$
- A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
 A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
- What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$
 A) The function tends to $+\infty$ B) The function tends to $-\infty$
 C) The function tends to -2 D) The function tends to 0
- If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
 A) 6 B) $\frac{7}{4}$ C) $\frac{-1}{2}$ D) $\frac{3}{2}$
- Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$
 A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$
- Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point $(2, 10)$
 A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
 C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$
- Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
 A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
- Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
 A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$
 C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
- Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
 A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$



26. The figure on the right shows the graph of a function $f(x)$

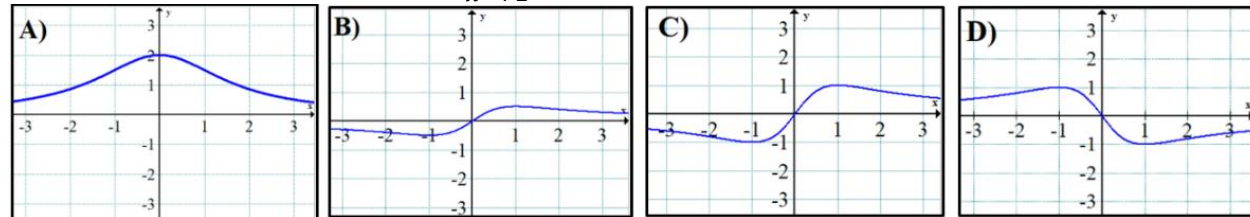
Which of the following is true ?

- A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$



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

graph of the function $f(x) = \frac{2x}{x^2+1}$



28. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2

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

30. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

- A) $]0, \frac{5\pi}{3}[$ B) $]\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $]\frac{4\pi}{3}, 2\pi[$

31. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$

- A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2

32. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$ A) 3 B) 2 C) -1 D) -2

33. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$

- A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2

34. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$

have no points of discontinuity.

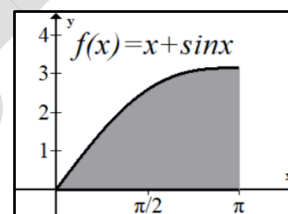
- A) 3 B) 1 C) 2 D) -2

35. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?

- A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None

36. Find the area of the shaded region where $f(x) = x + \sin x$

- A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$



37. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100

- A) 1750 B) 1000 C) 1500 D) 1250

38. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$

- A) -3 B) 3 C) -2 D) 2

39. The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$

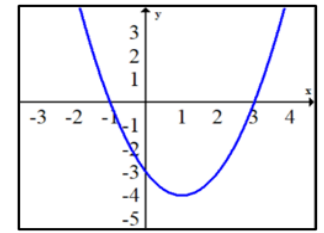
40. Find the third derivative of the function $f(x) = x \ln x$

- A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$

41. The figure on the right shows the graph of the derivative of the function f . which of the following is true ?

A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$

C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$



42. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$

- A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$

43. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2-3x+1}{x+1}$

- A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None

44. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :

- A) $x^2 + 2\tan x + c$ B) $x^2 - 2\tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2\tan x + c$

45. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2-bx+5}{x-1}$ are intersected at $x = -2$

- A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them

46. Find $F'(x)$ if $F(x) = \int_8^x t^{\frac{1}{3}} dt$

- A) $F'(x) = 8 - x^{\frac{1}{3}}$ B) $F'(x) = x^{\frac{1}{3}}$ C) $F'(x) = -x^{\frac{1}{3}}$ D) $F'(x) = x^{\frac{1}{3}} - 8$

47. If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$

- A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$

48. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$

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

49. If $e^y = -\sin x$, find y'

- A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

50. Which of the following is true?

A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$

B) If $f(a) = f(b)$ then $a = b$

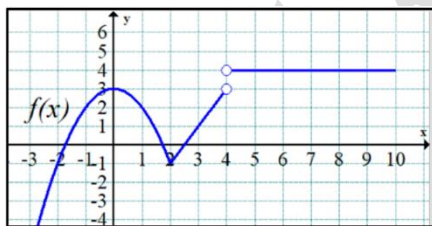
C) If f is a rational function then it has at least one vertical asymptote.

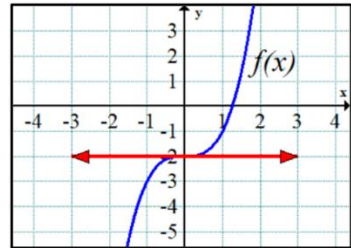
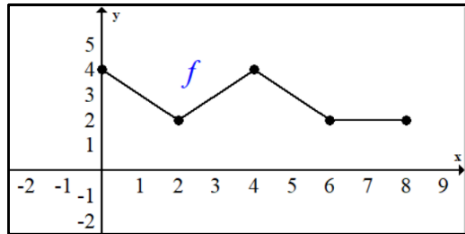
D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$

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Fingerprint

Choose the correct option. (2 marks for each question)

- Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
 - $f(x) = \frac{x^2-16}{2x-4}$
 - $f(x) = \frac{4x-16}{4x^2-8}$
 - $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$
 - $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
- What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
 - 1 and 1
 - 0 and 1
 - 0 and 2
 - 0 and -2
- The result of $\int_0^1 (x^2 + 1)^2 dx$ is :
 - $\frac{1}{12}$
 - $\frac{1}{15}$
 - $\frac{28}{15}$
 - $\frac{5}{12}$
- Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$
 - $-\infty$
 - $+\infty$
 - 2
 - 2
- Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$
 - $\sin x + \cos x + c$
 - $-\sin x - \cos x + c$
 - $\sin x - \cos x + c$
 - $\ln |\cos x + \sin x| + c$
- $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$
 - $(t - 1)^2$
 - $(t - 1)(t + 2)$
 - $(t - 2)(t + 1)$
 - None of them
- Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$
 - $]0, \frac{5\pi}{3}[$
 - $]\frac{2\pi}{3}, \frac{4\pi}{3}[$
 - $]0, \frac{2\pi}{3}[$
 - $]\frac{4\pi}{3}, 2\pi[$
- At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?
 - $x = 0$
 - $x = 1$
 - $x = 2$
 - None
- What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$
 - The function tends to $+\infty$
 - The function tends to $-\infty$
 - The function tends to -2
 - The function tends to 0
- Use the given graph on the right, to find the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$

 - 4
 - 2
 - 1
 - 3
- Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$
 - 3
 - 3
 - 2
 - 2
- Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)
 - 3
 - e
 - 1
 - 1
- Find the third derivative of the function $f(x) = x \ln x$
 - $\frac{1}{x}$
 - $\frac{2}{x^2}$
 - $\frac{-2}{x^2}$
 - $\frac{-1}{x^2}$
- Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
 - $a = \frac{1}{2}, b = -2$
 - $a = \frac{1}{3}, b = 2$
 - $a = \frac{1}{2}, b = 2$
 - $a = \frac{1}{3}, b = -3$

- Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
 - 1750
 - 1000
 - 1500
 - 1250
- Find the range of the function $f(x) = \frac{1}{|x+3|}$
 - $R - \{0\}$
 - $R - \{-3\}$
 - $]0, +\infty[$
 - R
- The figure on the right shows the graph of a function $f(x)$

Which of the following is true ?
 - $f''(0) < f''(1)$
 - $f'(0) < f''(-1)$
 - $f(-1) > f(1)$
 - $f'(-1) + f'(1) < 0$
- Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$
 - 3
 - 2
 - 1
 - 2
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$
 - 2
 - $\frac{1}{4}$
 - 2
 - $\frac{1}{2}$
- Which of the following functions is symmetric with respect the origin ?
 - $f(x) = |x|$
 - $f(x) = \cos^3 x$
 - $f(x) = x \sin^2 x$
 - $f(x) = 1 - \sqrt{x+3}$
- Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2-3x+1}{x+1}$
 - $y = 0$
 - $y = 4$
 - $y = 2$
 - None
- Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$
 - $\lim_{x \rightarrow 2} f(x) \neq f(1)$
 - $\lim_{x \rightarrow 0^+} f(x) = 0$
 - $\lim_{x \rightarrow 2^-} f(x) = 5$
 - $f(2) \neq 0$
- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2-x-1}{x-1}$
 - $x = 2, y = x + 1$
 - $x = 1, y = -x + 1$
 - $x = -1, y = 2x - 1$
 - $x = 1, y = -(x + 2)$
- Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

 - $\frac{11}{4}$
 - 22
 - $\frac{11}{8}$
 - $\frac{9}{4}$
- Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
 - $]0, +\infty[$
 - $]-\infty, 0[$
 - $]4, +\infty[$
 - $]-\infty, 4[$
- Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a), (\frac{-2}{3}, \frac{4}{5})$ is -1
 - 15
 - $\frac{17}{16}$
 - $\frac{9}{5}$
 - $\frac{7}{15}$
- If $e^y = -\sin x$, find y'
 - $y' = \tan x$
 - $y' = -\tan x$
 - $y' = \frac{1}{\tan x}$
 - $y' = \frac{-1}{\tan x}$

28. Which of the following is true?

A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$

B) If $f(a) = f(b)$ then $a = b$

C) If f is a rational function then it has at least one vertical asymptote.

D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$

29. A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.

A) -2 m/s

B) 4 m/s

C) 1 m/s

D) -3 m/s

30. The result of $\int_0^2 x e^x dx$ is:

A) e^2

B) $e^2 - 1$

C) $e^2 + 1$

D) $\frac{e^2}{2} + 2$

31. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'\left(\frac{1}{2}\right)$

A) $\frac{7}{2}$

B) $\frac{5}{2}$

C) $\frac{3}{2}$

D) 2

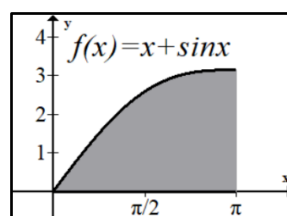
32. Find the area of the shaded region where $f(x) = x + \sin x$

A) $\pi^2 + 1$

B) $\frac{\pi^2}{2} + 1$

C) $\frac{\pi^2 + 4}{2}$

D) $\frac{\pi^2}{2}$



33. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$

A) $\frac{\sin x}{2 + \cos^2 x}$

B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$

C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$

D) $\frac{-\sin 2x}{2 + \cos^2 x}$

34. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)

A) $F(x) = \frac{(10 - 4x^2)^3}{12} + 28$

B) $F(x) = \frac{(10 - 4x^2)^3}{12} - 28$

C) $F(x) = \frac{-(10 - 4x^2)^3}{12} + 8$

D) $F(x) = \frac{-(10 - 4x^2)^3}{12} - 8$

35. Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$

A) $F'(x) = 8 - x \sqrt[3]{x}$

B) $F'(x) = x \sqrt[3]{x}$

C) $F'(x) = -x \sqrt[3]{x}$

D) $F'(x) = x \sqrt[3]{x} - 8$

36. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x - 1}$ are intersected at $x = -2$

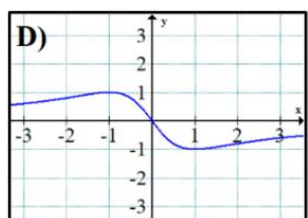
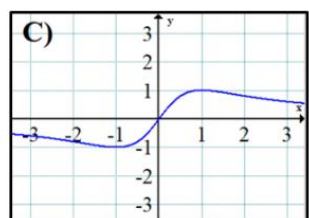
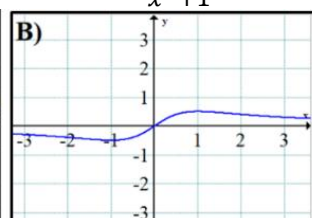
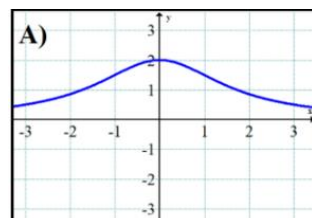
A) 2

B) $-\frac{9}{4}$

C) $\frac{9}{4}$

D) None of them

37. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2 + 1}$



38. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$

A) $]-\infty, 2]$

B) $[2, +\infty[$

C) $[-2, +\infty[$

D) $\mathbb{R}$

39. Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$

A) 1

B) $\frac{\sqrt{5}}{5}$

C) $\frac{2}{\sqrt{5}}$

D) $\sqrt{5}$

40. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

A) $f(x) = (x - 3)(x^2 + 4)$

B) $f(x) = (x + 3)(x^2 + 4)$

C) $f(x) = (x - 3)(x^2 - 4)$

D) $f(x) = (x - 4)(x - 3)$

41. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$

A) -1

B) -2

C) 3

D) Does not exist

42. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$

A) 3

B) 0

C) 4

D) 2

43. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?

A) 6

B) $\frac{7}{4}$

C) $-\frac{1}{2}$

D) $\frac{3}{2}$

44. Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$

A) $\frac{5}{2}$

B) 2

C) 6

D) 1

45. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is:

A) $x^2 + 2 \tan x + c$

B) $x^2 - 2 \tan x + c$

C) $x^2 + \tan 2x + c$

D) $2x + 2 \tan x + c$

46. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.

A) 3

B) 1

C) 2

D) -2

47. If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$

A) $6b - 3a$

B) $6b + 3a$

C) $4b - a$

D) $a + 2b + 4$

48. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$

A) $y = x + \pi$

B) $y = -x - 1 + \pi$

C) $y = x + 1 + \pi$

D) $y = x - \pi$

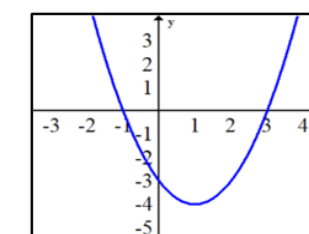
49. The figure on the right shows the graph of the derivative of the function f . which of the following is true?

A) $f(2) < f(1) < f(0)$

B) $f(1) < f(2) < f(0)$

C) $f(0) < f(1) < f(2)$

D) $f(2) = f(1) = f(0)$



50. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$

A) -2

B) 2

C) 4

D) -3

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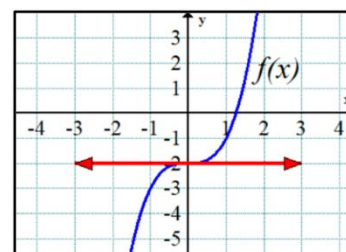
Choose the correct option. (2 marks for each question)

1. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)

A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$

2. The figure on the right shows the graph of a function $f(x)$
Which of the following is true ?

A) $f''(0) < f''(1)$ B) $f'(0) < f'(-1)$
C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$



3. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$

A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2

4. A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.

A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s

5. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$

A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$

6. Find the range of the function $f(x) = \frac{1}{|x+3|}$

A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R

7. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$

A) 3 B) 2 C) -1 D) -2

8. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$

A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$

9. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$

A) The function tends to $+\infty$ B) The function tends to $-\infty$
C) The function tends to -2 D) The function tends to 0

10. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :

A) $x^2 + 2\tan x + c$ B) $x^2 - 2\tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2\tan x + c$

11. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$

A) -3 B) 3 C) -2 D) 2

12. Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$

A) $\frac{5}{2}$ B) 2 C) 6 D) 1

13. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.

A) 3 B) 1 C) 2 D) -2

14. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$

A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$

15. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100

A) 1750 B) 1000 C) 1500 D) 1250

16. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$

A) $-\infty$ B) $+\infty$ C) -2 D) 2

17. Which of the following functions is symmetric with respect the origin ?

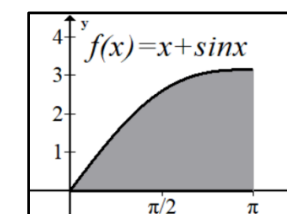
A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x+3}$

18. Find the third derivative of the function $f(x) = x \ln x$

A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$

19. Find the area of the shaded region where $f(x) = x + \sin x$

A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$



20. Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$

A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$

21. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$

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

22. If $e^y = -\sin x$, find y'

A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

23. The result of $\int_0^1 (x^2 + 1)^2 dx$ is :

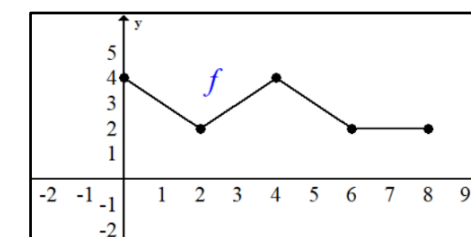
A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$

24. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$

A) -1 B) -2 C) 3 D) Does not exist

25. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

A) $\frac{11}{4}$ B) 22
C) $\frac{11}{8}$ D) $\frac{9}{4}$



26. Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)

A) 3 B) e C) -1 D) 1

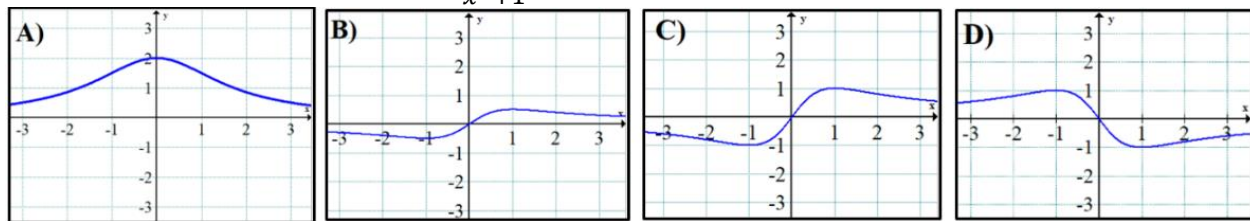
27. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$

A) 3 B) 0 C) 4 D) 2

28. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?

- A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None

29. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2+1}$



30. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

- A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$

31. Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2-x-1}{x-1}$

- A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x + 2)$

32. Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$

- A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$

33. Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$

- A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$

34. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$

find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$

- A) -2 B) 2 C) 4 D) -3

35. Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1

- A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$

36. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2-bx+5}{x-1}$ are intersected

- at $x = -2$ A) 2 B) $\frac{-9}{4}$ C) $\frac{9}{4}$ D) None of them

37. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$

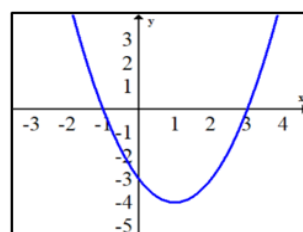
- A) $]-\infty, 2]$ B) $[2, +\infty[$ C) $[-2, +\infty[$ D) R

38. $f(x) = x^2 + x - 2$ Which of the following equals $f(t-1)$

- A) $(t-1)^2$ B) $(t-1)(t+2)$ C) $(t-2)(t+1)$ D) None of them

39. The figure on the right shows the graph of the derivative of the function f . which of the following is true ?

- A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$



40. The result of $\int_0^2 x e^x dx$ is :

- A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$

41. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$

- A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2

42. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

- A) $]0, \frac{5\pi}{3}[$ B) $]\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $]\frac{4\pi}{3}, 2\pi[$

43. Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$

- A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$
C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$

44. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2-3x+1}{x+1}$

- A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None

45. Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$

- A) $a = \frac{1}{2}$, $b = -2$ B) $a = \frac{1}{3}$, $b = 2$ C) $a = \frac{1}{2}$, $b = 2$ D) $a = \frac{1}{3}$, $b = -3$

46. Which of the following is true?

- A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
B) If $f(a) = f(b)$ then $a = b$
C) If f is a rational function then it has at least one vertical asymptote.
D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$

47. If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$

- A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$

48. Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$

- A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$

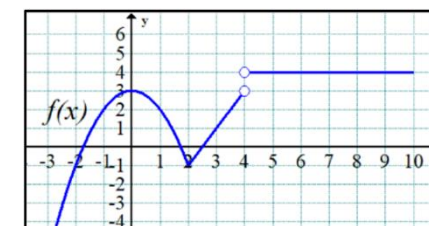
49. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?

- A) 6 B) $\frac{7}{4}$ C) $\frac{-1}{2}$ D) $\frac{3}{2}$

50. Use the given graph on the right, to find

the result of $\frac{f(-1) - 2 \lim_{x \rightarrow 4^+} f(x)}{f(0)}$

- A) 4 B) -2
C) 1 D) 3



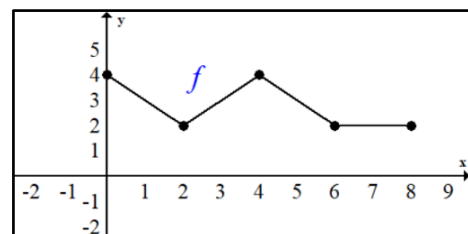
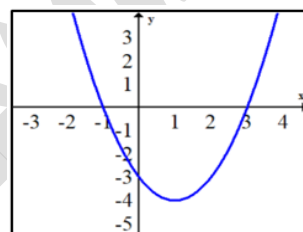
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Choose the correct option. (2 marks for each question)

- The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$
- Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
A) 1750 B) 1000 C) 1500 D) 1250
- What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$
A) The function tends to $+\infty$ B) The function tends to $-\infty$
C) The function tends to -2 D) The function tends to 0
- Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)
A) 3 B) e C) -1 D) 1
- The result of $\int_0^2 x e^x dx$ is :
A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$
- Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$
A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$
- Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x+1}$
A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
- Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$
A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$
- Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$
A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$
- The figure on the right shows the graph of the derivative of the function f . which of the following is true ?
A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$
- Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x-1}$ are intersected at $x = -2$
A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them



- Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$
A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$
- Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
- If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
A) -1 B) -2 C) 3 D) Does not exist
- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x-1}$
A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x + 2)$
- Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$ A) $\frac{5}{2}$ B) 2 C) 6 D) 1
- Find the result of $\int (\frac{1 + \sin 2x}{\cos x + \sin x}) dx$
A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$
- Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
A) $]0, +\infty[$ B) $]-\infty, 0[$ C) $]4, +\infty[$ D) $]-\infty, 4[$
- Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2
- If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
A) 6 B) $\frac{7}{4}$ C) $-\frac{1}{2}$ D) $\frac{3}{2}$
- Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
A) $f(x) = \frac{x^2 - 16}{2x - 4}$ B) $f(x) = \frac{4x - 16}{4x^2 - 8}$
C) $f(x) = \begin{cases} \frac{x^2 - 4}{4 - 2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2 - 16}{4 - 2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
- Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2 + 1}$
A) B) C) D)
- A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
- $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$
A) $(t - 1)^2$ B) $(t - 1)(t + 2)$ C) $(t - 2)(t + 1)$ D) None of them
- At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?
A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None

27. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$ A) 3 B) 2 C) -1 D) -2

28. If $\int_a^b f(x)dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$

A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$

29. Find the third derivative of the function $f(x) = x \ln x$

A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$

30. Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$

A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$

31. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)

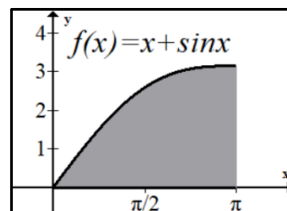
A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$

32. Find the range of the function $f(x) = \frac{1}{|x+3|}$ □

A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R

33. Find the area of the shaded region where $f(x) = x + \sin x$

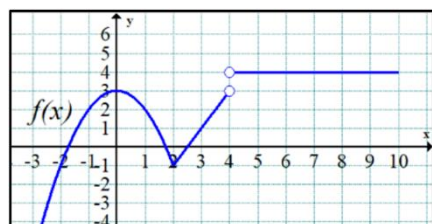
A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$



34. Use the given graph on the right, to find

the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$

A) 4 B) -2
C) 1 D) 3



35. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.

A) 3 B) 1 C) 2 D) -2

36. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

A) $]0, \frac{5\pi}{3}[$ B) $[\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $[\frac{4\pi}{3}, 2\pi[$

37. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$ A) $-\infty$ B) $+\infty$ C) -2 D) 2

38. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$

A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2

39. Which of the following functions is symmetric with respect the origin ?

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

40. Find the distance between the graph of the point of the intersection of the two functions

$f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$

A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$

41. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$

A) -3 B) 3 C) -2 D) 2

42. If $e^y = -\sin x$, find y'

A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

43. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$

A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$

44. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$

A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2

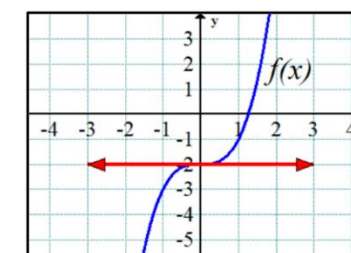
45. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$

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

46. The figure on the right shows the graph of a function $f(x)$

Which of the following is true ?

A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$



47. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$

find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$

A) -2 B) 2 C) 4 D) -3

48. Which of the following is true?

A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
B) If $f(a) = f(b)$ then $a = b$
C) If f is a rational function then it has at least one vertical asymptote.
D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$

49. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$

50. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :

A) $x^2 + 2\tan x + c$ B) $x^2 - 2\tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2\tan x + c$

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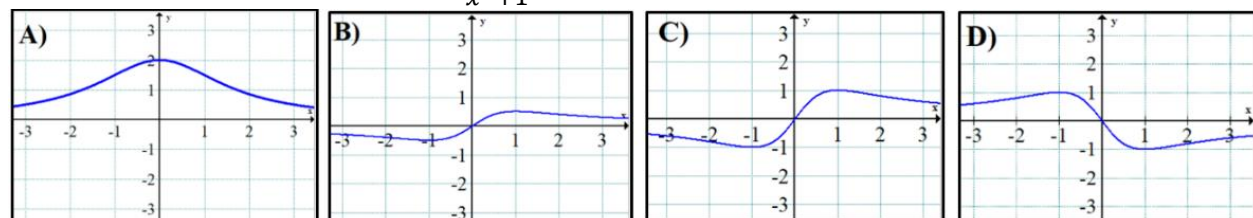


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Choose the correct option. (2 marks for each question)

- Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
 A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$
- Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$
 A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$
- Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2+1}$

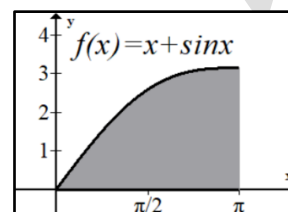


- Which of the following is true?

- A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
 B) If $f(a) = f(b)$ then $a = b$
 C) If f is a rational function then it has at least one vertical asymptote.
 D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$

- Find the area of the shaded region where $f(x) = x + \sin x$

- A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
 C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$



- Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1

- A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$

- Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$

- A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$
 C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$

- Find the third derivative of the function $f(x) = x \ln x$

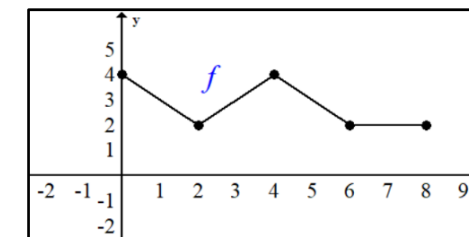
- A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$

- If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$

- A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$

- Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

- A) $\frac{11}{4}$ B) 22
 C) $\frac{11}{8}$ D) $\frac{9}{4}$



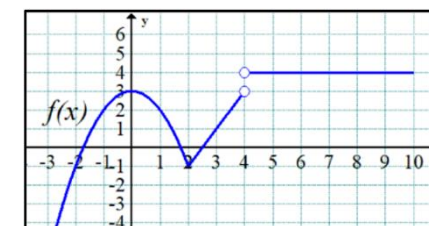
- The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :

- A) $x^2 + 2 \tan x + c$ B) $x^2 - 2 \tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2 \tan x + c$

- Use the given graph on the right, to find

the result of $\frac{f(-1) - 2 \lim_{x \rightarrow 4^+} f(x)}{f(0)}$

- A) 4 B) -2
 C) 1 D) 3



- A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.

- A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s

- Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x-1}$ are intersected at $x = -2$

- A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them

- Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)

- A) 3 B) e C) -1 D) 1

- If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$

- A) -1 B) -2 C) 3 D) Does not exist

- Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$

- A) $-\infty$ B) $+\infty$ C) -2 D) 2

- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x-1}$

- A) $x = 2, y = x + 1$ B) $x = 1, y = -x + 1$
 C) $x = -1, y = 2x - 1$ D) $x = 1, y = -(x + 2)$

- At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection?

- A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None

- Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100

- A) 1750 B) 1000 C) 1500 D) 1250

- Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x+1}$

- A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None

- If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?

- A) 6 B) $\frac{7}{4}$ C) $-\frac{1}{2}$ D) $\frac{3}{2}$

23. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$

find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$

- A) -2 B) 2 C) 4 D) -3

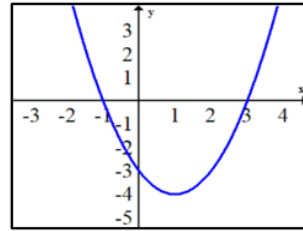
24. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2

25. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$

- A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$

26. The figure on the right shows the graph of the derivative of the function f . which of the following is true ?

- A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$



27. If $e^y = -\sin x$, find y'

- A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

28. Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$

- A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$

29. Find the distance between the graph of the point of the intersection of the two functions

$f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$

- A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$

30. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

- A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$

31. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$

- A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2

32. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$

- A) -3 B) 3 C) -2 D) 2

33. Which of the following functions is symmetric with respect the origin ?

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

34. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

- A) $]0, \frac{5\pi}{3}[$ B) $] \frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $] \frac{4\pi}{3}, 2\pi[$

35. $f(x) = x^2 + x - 2$ Which of the following equals $f(t-1)$

- A) $(t-1)^2$ B) $(t-1)(t+2)$ C) $(t-2)(t+1)$ D) None of them

36. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point $(2, 10)$

- A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$

37. Find the range of the function $f(x) = \frac{1}{|x+3|}$ □

- A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R

38. Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$

- A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$

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

40. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$

have no points of discontinuity.

- A) 3 B) 1 C) 2 D) -2

41. Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$

- A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
C) $\sin x - \cos x + c$ D) $\ln|\cos x + \sin x| + c$

42. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$

- A) The function tends to $+\infty$ B) The function tends to $-\infty$
C) The function tends to -2 D) The function tends to 0

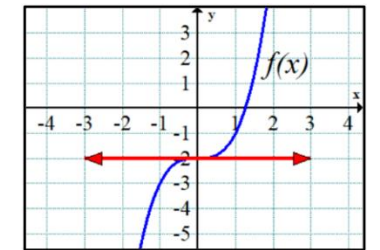
43. The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$

44. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$ A) 3 B) 2 C) -1 D) -2

45. The figure on the right shows the graph of a function $f(x)$

Which of the following is true ?

- A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$



46. The result of $\int_0^2 x e^x dx$ is :

- A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$

47. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$

- A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$

48. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$

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

49. Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$

- A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$

50. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$

- A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2

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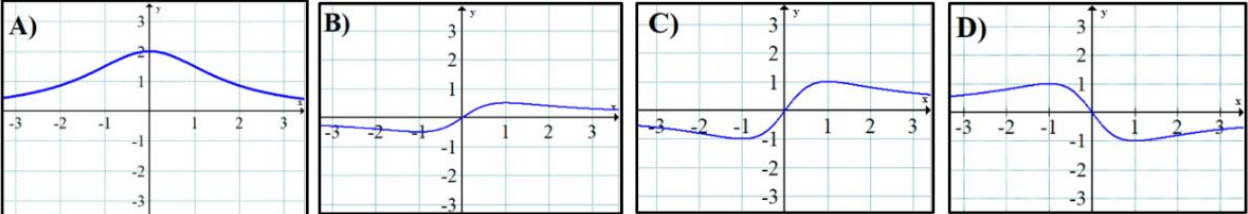


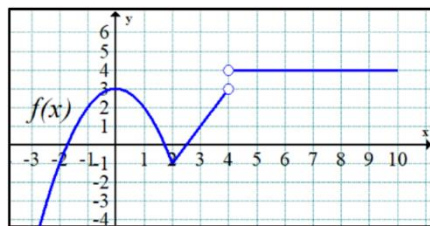
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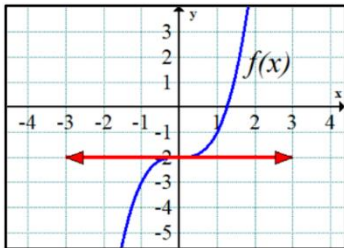
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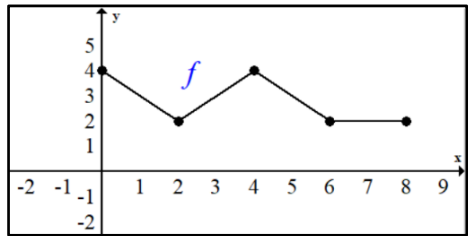
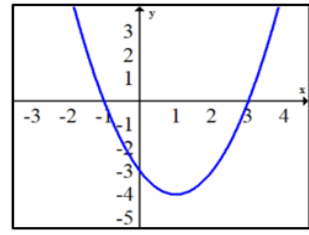
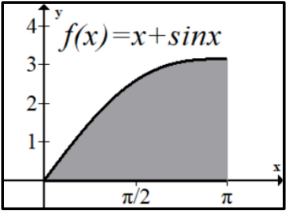
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Choose the correct option. (2 marks for each question)

- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2-x-1}{x-1}$
 A) $x = 2, y = x + 1$ B) $x = 1, y = -x + 1$
 C) $x = -1, y = 2x - 1$ D) $x = 1, y = -(x + 2)$
- $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$
 A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2
- If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
 A) 6 B) $\frac{7}{4}$ C) $-\frac{1}{2}$ D) $\frac{3}{2}$
- Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2+1}$

- A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
 A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
- Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
 A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$
- What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$
 A) The function tends to $+\infty$ B) The function tends to $-\infty$
 C) The function tends to -2 D) The function tends to 0
- Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2-bx+5}{x-1}$ are intersected at $x = -2$
 A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them
- What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
 A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2
- Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$
 A) -3 B) 3 C) -2 D) 2
- Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
 A) 1750 B) 1000 C) 1500 D) 1250

- Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$ A) $\frac{5}{2}$ B) 2 C) 6 D) 1
- Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a), (\frac{-2}{3}, \frac{4}{5})$ is -1
 A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
- Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$
 A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$
 A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$
- Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$
 A) $]0, \frac{5\pi}{3}[$ B) $[\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $[\frac{4\pi}{3}, 2\pi[$
- Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$
 A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$
- If $e^y = -\sin x$, find y'
 A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$
- The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :
 A) $x^2 + 2\tan x + c$ B) $x^2 - 2\tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2\tan x + c$
- Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2
- Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$ A) 3 B) 2 C) -1 D) -2
- Use the given graph on the right, to find the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$

 A) 4 B) -2
 C) 1 D) 3
- Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x}-1}{\ln(x+1)}$ (Use L'Hôpital's rule)
 A) 3 B) e C) -1 D) 1
- Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$
 A) $\lim_{x \rightarrow 2^-} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$
- If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$
 A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$
- Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point $(2, 10)$
 A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
 C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$

27. Find the result of $\int \left(\frac{1+\sin 2x}{\cos x + \sin x} \right) dx$
 A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
 C) $\sin x - \cos x + c$ D) $\ln|\cos x + \sin x| + c$
28. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$
 A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
 C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$
29. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$ A) $-\infty$ B) $+\infty$ C) -2 D) 2
30. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
 A) -1 B) -2 C) 3 D) Does not exist
31. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.
 A) 3 B) 1 C) 2 D) -2
32. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
 A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$
33. Find the range of the function $f(x) = \frac{1}{|x+3|}$ $\square$
 A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R
34. Find the domain of the function $(f \circ g \circ h)_{(x)}$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$
 A) $] -\infty, 2]$ B) $[2, +\infty[$ C) $[-2, +\infty[$ D) R
35. The figure on the right shows the graph of a function $f(x)$. Which of the following is true?
 A) $f''(0) < f''(1)$ B) $f'(0) < f'(-1)$
 C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$
- 
36. The result of $\int_0^1 (x^2 + 1)^2 dx$ is: A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$
37. Which of the following is true?
 A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
 B) If $f(a) = f(b)$ then $a = b$
 C) If f is a rational function then it has at least one vertical asymptote.
 D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$
38. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$
 A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$
39. Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
 A) $f(x) = \frac{x^2 - 16}{2x - 4}$ B) $f(x) = \frac{4x - 16}{4x^2 - 8}$
 C) $f(x) = \begin{cases} \frac{x^2 - 4}{4 - 2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2 - 16}{4 - 2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$

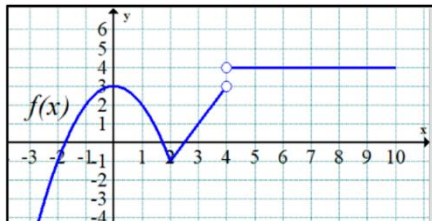
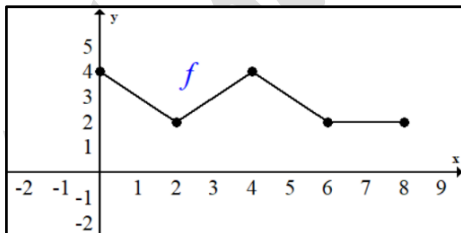
40. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection?
 A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None
41. $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$
 A) $(t - 1)^2$ B) $(t - 1)(t + 2)$ C) $(t - 2)(t + 1)$ D) None of them
42. Which of the following functions is symmetric with respect the origin?
 A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x + 3}$
43. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$
 A) -2 B) 2 C) 4 D) -3
44. Find the third derivative of the function $f(x) = x \ln x$
 A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$
45. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$
 A) $\frac{11}{4}$ B) 22
 C) $\frac{11}{8}$ D) $\frac{9}{4}$
- 
46. Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$
 A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$
47. The figure on the right shows the graph of the derivative of the function f . which of the following is true?
 A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
 C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$
- 
48. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$
 A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
49. Find the area of the shaded region where $f(x) = x + \sin x$
 A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
 C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$
- 
50. The result of $\int_0^2 x e^x dx$ is:
 A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$

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Choose the correct option. (2 marks for each question)

- Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$
 A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$
- The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :
 A) $x^2 + 2\tan x + c$ B) $x^2 - 2\tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2\tan x + c$
- Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
 A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
- A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
 A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
- Use the given graph on the right, to find the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$

 A) 4 B) -2 C) 1 D) 3
- Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$
 A) $]0, \frac{5\pi}{3}[$ B) $[\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $[\frac{4\pi}{3}, 2\pi[$
- Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
 A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$
- Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

 A) $\frac{11}{4}$ B) 22 C) $\frac{11}{8}$ D) $\frac{9}{4}$
- Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
 A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$ C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
- If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$
 A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$

11. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

- A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
 C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$

12. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$

- A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$

13. Find the result of $\int (\frac{1 + \sin 2x}{\cos x + \sin x}) dx$

- A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
 C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$

14. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2

15. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100

- A) 1750 B) 1000 C) 1500 D) 1250

16. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)

- A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
 C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$

17. Which of the following is true?

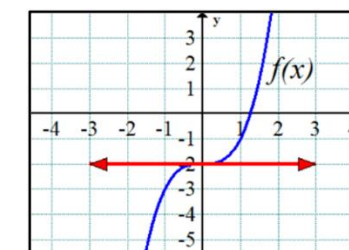
- A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
 B) If $f(a) = f(b)$ then $a = b$
 C) If f is a rational function then it has at least one vertical asymptote.
 D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$

18. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$

- A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$

19. The figure on the right shows the graph of a function $f(x)$. Which of the following is true?

- A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
 C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$

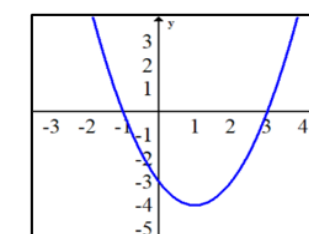


20. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$

- A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2

21. The figure on the right shows the graph of the derivative of the function f . which of the following is true?

- A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
 C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$



22. Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)

- A) 3 B) e C) -1 D) 1

23. Which of the following functions is symmetric with respect the origin ?

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

24. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$

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

25. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x-1}$ are intersected

- at $x = -2$ A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them

26. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$

have no pionts of discontinuity.

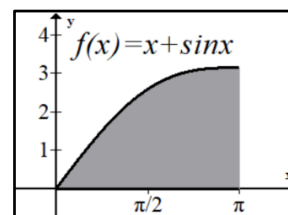
- A) 3 B) 1 C) 2 D) -2

27. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?

- A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None

28. Find the area of the shaded region where $f(x) = x + \sin x$

- A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$



29. The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$

30. Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$

- A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$

31. Find the third derivative of the function $f(x) = x \ln x$

- A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$

32. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$

- A) The function tends to $+\infty$ B) The function tends to $-\infty$
C) The function tends to -2 D) The function tends to 0

33. Find the range of the function $f(x) = \frac{1}{|x+3|}$ □

- A) $\mathbb{R} - \{0\}$ B) $\mathbb{R} - \{-3\}$ C) $]0, +\infty[$ D) $\mathbb{R}$

34. $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$

- A) $(t - 1)^2$ B) $(t - 1)(t + 2)$ C) $(t - 2)(t + 1)$ D) None of them

35. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x+1}$

- A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None

36. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$

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

37. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$

- A) -3 B) 3 C) -2 D) 2

38. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$

- A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$

39. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$

find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$

- A) -2 B) 2 C) 4 D) -3

40. Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x - 1}$

- A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x + 2)$

41. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?

- A) 6 B) $\frac{7}{4}$ C) $-\frac{1}{2}$ D) $\frac{3}{2}$

42. Find the distance between the graph of the point of the intersection of the two functions

$f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$

- A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$

43. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$

- A) -1 B) -2 C) 3 D) Does not exist

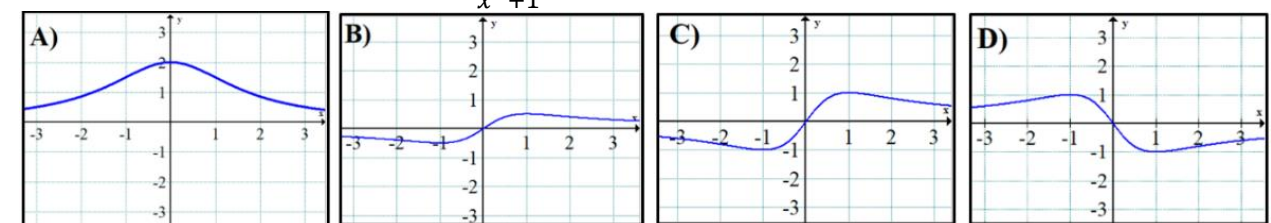
44. Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$ A) $\frac{5}{2}$ B) 2 C) 6 D) 1

45. If $e^y = -\sin x$, find y'

- A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

46. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1} - 1}$ A) 3 B) 2 C) -1 D) -2

47. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2 + 1}$



48. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$ A) $-\infty$ B) $+\infty$ C) -2 D) 2

49. The result of $\int_0^2 x e^x dx$ is :

- A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$

50. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$

- A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2



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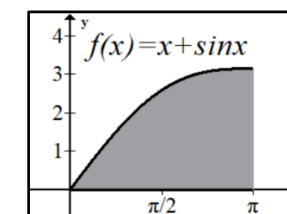
Choose the correct option. (2 marks for each question)

- Find the range of the function $f(x) = \frac{1}{|x+3|}$ ☐
A) $R - \{0\}$ B) $R - \{-3\}$ C) $] 0, +\infty[$ D) R
 - Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)
A) 3 B) e C) -1 D) 1
 - The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$
 - If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$
A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$
 - Which of the following functions is symmetric with respect the origin ?
A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x+3}$
 - Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$
A) $\frac{11}{4}$ B) 22
C) $\frac{11}{8}$ D) $\frac{9}{4}$
-
- Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2+1}$
A) B) C) D)
 - Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$ A) 3 B) 2 C) -1 D) -2
 - If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
A) -1 B) -2 C) 3 D) Does not exist
 - Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $] 0, 2\pi [$
A) $] 0, \frac{5\pi}{3} [$ B) $] \frac{2\pi}{3}, \frac{4\pi}{3} [$ C) $] 0, \frac{2\pi}{3} [$ D) $] \frac{4\pi}{3}, 2\pi [$
 - $f(x) = x^2 + x - 2$ Which of the following equals $f(t-1)$
A) $(t-1)^2$ B) $(t-1)(t+2)$ C) $(t-2)(t+1)$ D) None of them
 - Find the equation of the tangent line to the graph of the curve $x+1 = \tan y$ at $y = \pi$
A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$
 - If $e^y = -\sin x$, find y'
A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

- Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
A) 1750 B) 1000 C) 1500 D) 1250

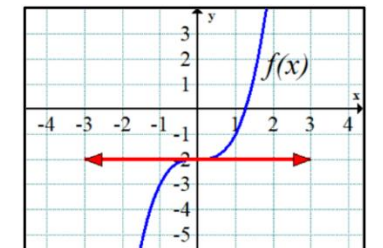
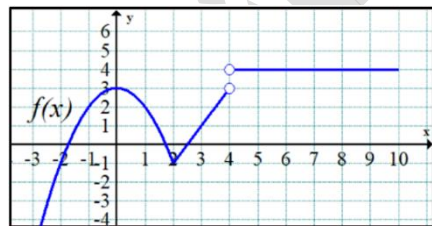
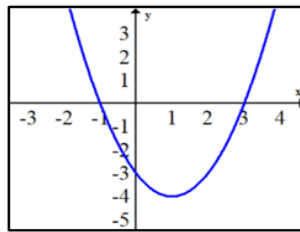
- Find the area of the shaded region where $f(x) = x + \sin x$

- A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
C) $\frac{\pi^2+4}{2}$ D) $\frac{\pi^2}{2}$



- Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$
A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$
- Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$
A) $] -\infty, 2]$ B) $[2, +\infty[$ C) $[-2, +\infty[$ D) R
- A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
- Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$
A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$
- Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no pions of discontinuity.
A) 3 B) 1 C) 2 D) -2
- Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$
A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$
- Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$
A) -3 B) 3 C) -2 D) 2
- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2-x-1}{x-1}$
A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x+2)$
- Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2-bx+5}{x-1}$ are intersected at $x = -2$
A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them
- Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$
A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$
- Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$
A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$

27. Find the third derivative of the function $f(x) = x \ln x$
 A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$
28. The result of $\int_0^2 x e^x dx$ is :
 A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$
29. Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
 A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$
30. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$
 A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
31. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :
 A) $x^2 + 2 \tan x + c$ B) $x^2 - 2 \tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2 \tan x + c$
32. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)
 A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
 C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$
33. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$
 A) The function tends to $+\infty$ B) The function tends to $-\infty$
 C) The function tends to -2 D) The function tends to 0
34. The figure on the right shows the graph of the derivative of the function f . which of the following is true ?
 A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
 C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$
35. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$
 A) $-\infty$ B) $+\infty$ C) -2 D) 2
36. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?
 A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None
37. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$
 A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2
38. Use the given graph on the right, to find the result of $\frac{f(-1) - 2 \lim_{x \rightarrow 4^+} f(x)}{f(0)}$
 A) 4 B) -2
 C) 1 D) 3
39. Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a), (\frac{-2}{3}, \frac{4}{5})$ is -1
 A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
40. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
 A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$



41. Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$ A) $\frac{5}{2}$ B) 2 C) 6 D) 1
42. Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x, g(x) = \sqrt{x}$ and the line $y = 2x - 1$
 A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$
43. Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
 A) $f(x) = \frac{x^2 - 16}{2x - 4}$ B) $f(x) = \frac{4x - 16}{4x^2 - 8}$
 C) $f(x) = \begin{cases} \frac{x^2 - 4}{4 - 2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2 - 16}{4 - 2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
44. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x} - 2} \leq f(x) \leq \frac{x^2}{1 - \cos 2x}$
 A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$
45. Which of the following is true?
 A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
 B) If $f(a) = f(b)$ then $a = b$
 C) If f is a rational function then it has at least one vertical asymptote.
 D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$
46. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3, y = 2$
 A) -2 B) 2 C) 4 D) -3
47. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2
48. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
 A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2
49. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
 A) 6 B) $\frac{7}{4}$ C) $\frac{-1}{2}$ D) $\frac{3}{2}$
50. The figure on the right shows the graph of a function $f(x)$. Which of the following is true ?
 A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
 C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$

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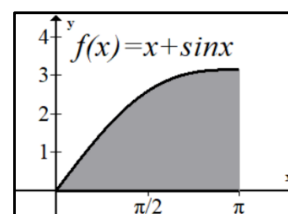


Fingerprint

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Choose the correct option. (2 marks for each question)

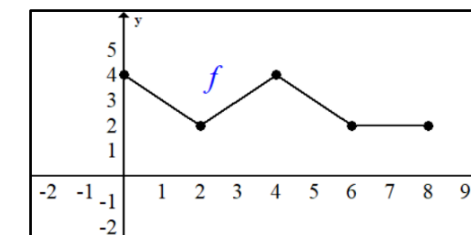
- The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$
- Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)
A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$
- Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2
- If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
A) 6 B) $\frac{7}{4}$ C) $-\frac{1}{2}$ D) $\frac{3}{2}$
- Which of the following functions is symmetric with respect the origin ?
A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x+3}$
- Find the area of the shaded region where $f(x) = x + \sin x$
A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
C) $\frac{\pi^2+4}{2}$ D) $\frac{\pi^2}{2}$



- Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$
A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$
- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2-x-1}{x-1}$
A) $x = 2, y = x + 1$ B) $x = 1, y = -x + 1$
C) $x = -1, y = 2x - 1$ D) $x = 1, y = -(x + 2)$
- Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$
A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$
- If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$
A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$
- Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$
C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
- Write the equation of the function whose x-intercepts are $x = 2, x = -2$ and $x = 3$
A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$

- Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x, g(x) = \sqrt{x}$ and the line $y = 2x - 1$
A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$

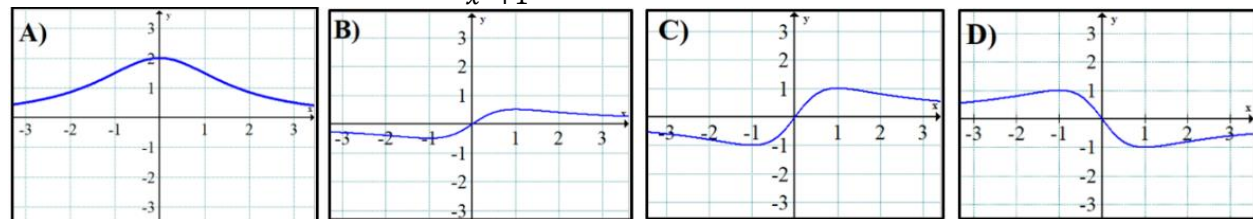
- The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :
A) $x^2 + 2 \tan x + c$ B) $x^2 - 2 \tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2 \tan x + c$
- Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$ A) $-\infty$ B) $+\infty$ C) -2 D) 2
- Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3, y = 2$
A) -2 B) 2 C) 4 D) -3
- Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x}-1}{\ln(x+1)}$ (Use L'Hôpital's rule)
A) 3 B) e C) -1 D) 1
- Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$
A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$
- Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$
A) $\frac{11}{4}$ B) 22
C) $\frac{11}{8}$ D) $\frac{9}{4}$



- Which of the following is true?
A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
B) If $f(a) = f(b)$ then $a = b$
C) If f is a rational function then it has at least one vertical asymptote .
D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$
- Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$
- What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$
A) The function tends to $+\infty$ B) The function tends to $-\infty$
C) The function tends to -2 D) The function tends to 0
- Find the range of the function $f(x) = \frac{1}{|x+3|}$ $\square$
A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R
- If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
A) -1 B) -2 C) 3 D) Does not exist
- If $e^y = -\sin x$, find y'
A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$
- Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$
A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$

27. $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$
 A) $(t - 1)^2$ B) $(t - 1)(t + 2)$ C) $(t - 2)(t + 1)$ D) None of them

28. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2 + 1}$

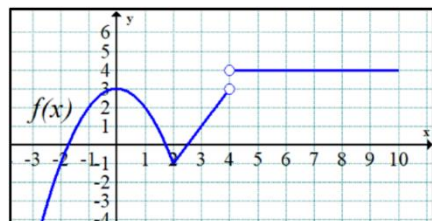


29. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.

- A) 3 B) 1 C) 2 D) -2
30. A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.

- A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
31. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x - 1}$ are intersected at $x = -2$

- A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them
32. Use the given graph on the right, to find the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$



- A) 4 B) -2 C) 1 D) 3
33. Find the third derivative of the function $f(x) = x \ln x$

- A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $-\frac{2}{x^2}$ D) $-\frac{1}{x^2}$
34. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100

- A) 1750 B) 1000 C) 1500 D) 1250
35. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$

- A) 3 B) 2 C) -1 D) -2
36. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

- A) $]0, \frac{5\pi}{3}[$ B) $]\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $]\frac{4\pi}{3}, 2\pi[$

37. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$

- A) -3 B) 3 C) -2 D) 2
38. Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a), (\frac{-2}{3}, \frac{4}{5})$ is -1

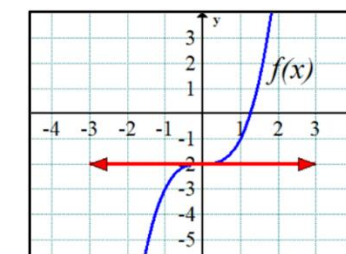
- A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
39. The result of $\int_0^2 x e^x dx$ is :

- A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$

40. Which of the following is false for the function $f(x) = \begin{cases} 2x + 1 & -1 < x < 2 \\ 3 & x = 2 \\ 1 + x^2 & 2 < x < 4 \end{cases}$

- A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$
41. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}, g(x) = 3x$ and $h(x) = x - 2$

- A) $]-\infty, 2]$ B) $[2, +\infty[$ C) $[-2, +\infty[$ D) R
42. The figure on the right shows the graph of a function $f(x)$

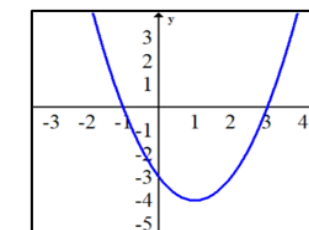


- Which of the following is true ?
- A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$

- C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$
43. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$

- A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$
44. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$

- A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
45. The figure on the right shows the graph of the derivative of the function f . which of the following is true ?



- A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
- C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$
46. Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$

- A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$
47. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$

- A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2
48. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$

- A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2
49. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?

- A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None
50. Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$

- A) $\frac{5}{2}$ B) 2 C) 6 D) 1

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Q

Choose the correct option. (2 marks for each question)

1. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$

find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$

A) -2 B) 2 C) 4 D) -3

2. The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$

3. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$

A) The function tends to $+\infty$ B) The function tends to $-\infty$
C) The function tends to -2 D) The function tends to 0

4. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$

have no points of discontinuity.

A) 3 B) 1 C) 2 D) -2

5. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$

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

6. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?

A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None

7. Find the derivative of the function $f(x) = \ln\sqrt{2 + \cos^2 x}$

A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$

8. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$

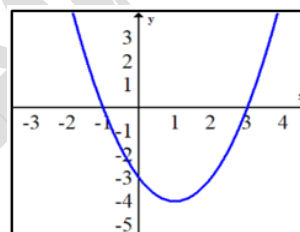
A) -3 B) 3 C) -2 D) 2

9. Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x - 1}$

A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x + 2)$

10. The figure on the right shows the graph of the derivative of the function f . which of the following is true ?

A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$



11. If $e^y = -\sin x$, find y'

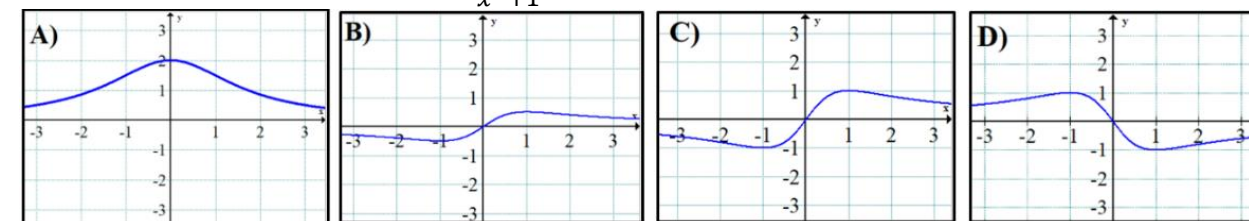
A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

12. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point $(2, 10)$

A) $F(x) = \frac{(10 - 4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10 - 4x^2)^3}{12} - 28$
C) $F(x) = \frac{-(10 - 4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10 - 4x^2)^3}{12} - 8$

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

graph of the function $f(x) = \frac{2x}{x^2 + 1}$



14. Which of the following is false for the function $f(x) = \begin{cases} 2x + 1 & -1 < x < 2 \\ 3 & x = 2 \\ 1 + x^2 & 2 < x < 4 \end{cases}$

A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$

15. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x - 1}$ are intersected

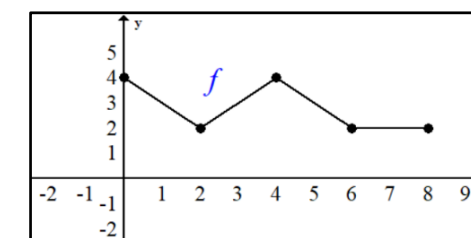
at $x = -2$ A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them

16. The result of $\int_0^2 x e^x dx$ is :

A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$

17. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

A) $\frac{11}{4}$ B) 22
C) $\frac{11}{8}$ D) $\frac{9}{4}$



18. Which of the following functions is symmetric with respect the origin ?

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

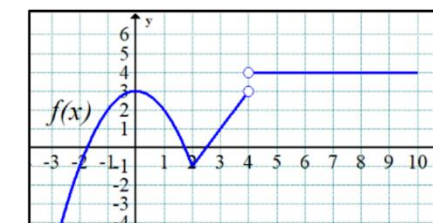
19. Which of the following functions is discontinuous at $x = 2$ and it has a non-removable

discontinuity at $x = 2$ A) $f(x) = \frac{x^2 - 16}{2x - 4}$ B) $f(x) = \frac{4x - 16}{4x^2 - 8}$
C) $f(x) = \begin{cases} \frac{x^2 - 4}{4 - 2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2 - 16}{4 - 2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$

20. Use the given graph on the right, to find

the result of $\frac{f(-1) - 2 \lim_{x \rightarrow 4^+} f(x)}{f(0)}$

A) 4 B) -2
C) 1 D) 3



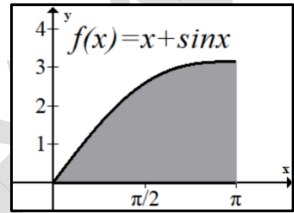
21. Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$ A) $\frac{5}{2}$ B) 2 C) 6 D) 1

22. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$

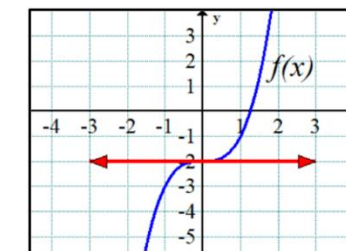
A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2

23. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

A) $]0, \frac{5\pi}{3}[$ B) $] \frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $] \frac{4\pi}{3}, 2\pi[$

24. Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$
- A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$
25. Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)
- A) 3 B) e C) -1 D) 1
26. Which of the following is true?
- A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
 B) If $f(a) = f(b)$ then $a = b$
 C) If f is a rational function then it has at least one vertical asymptote.
 D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$
27. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$
- A) $-\infty$ B) $+\infty$ C) -2 D) 2
28. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$
- A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
 C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$
29. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
- A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$
30. If $\int_a^b f(x)dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$
- A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$
31. $f(x) = x^2 + x - 2$ Which of the following equals $f(t-1)$
- A) $(t-1)^2$ B) $(t-1)(t+2)$ C) $(t-2)(t+1)$ D) None of them
32. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2-3x+1}{x+1}$
- A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
33. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is:
- A) $x^2 + 2\tan x + c$ B) $x^2 - 2\tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2\tan x + c$
34. Find the area of the shaded region where $f(x) = x + \sin x$
- A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
 C) $\frac{\pi^2+4}{2}$ D) $\frac{\pi^2}{2}$
- 
35. A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
- A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
36. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
- A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2

37. The figure on the right shows the graph of a function $f(x)$



- Which of the following is true ?
- A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
 C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$
38. Find the third derivative of the function $f(x) = x \ln x$
- A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$
39. Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$
- A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$
40. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
- A) 1750 B) 1000 C) 1500 D) 1250
41. Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
- A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
42. Find the range of the function $f(x) = \frac{1}{|x+3|}$
- A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R
43. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$
- A) 3 B) 2 C) -1 D) -2
44. Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$
- A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
 C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$
45. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
- A) 6 B) $\frac{7}{4}$ C) $\frac{-1}{2}$ D) $\frac{3}{2}$
46. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$
- A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$
47. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
- A) -1 B) -2 C) 3 D) Does not exist
48. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$
- A) 3 B) 0 C) 4 D) 2
49. Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
- A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$
50. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$
- A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$

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Time : 3:30 hours

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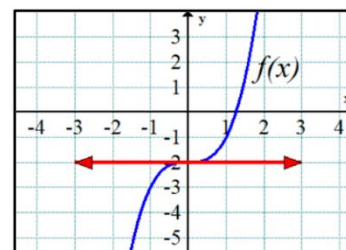
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Choose the correct option. (2 marks for each question)

1. The figure on the right shows the graph of a function $f(x)$

Which of the following is true ?

- A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
 C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$

2. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$

- A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None

3. Find the distance between the graph of the point of the intersection of the two functions

 $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$

- A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$

4. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100

- A) 1750 B) 1000 C) 1500 D) 1250

5. If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$

- A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$

6. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$

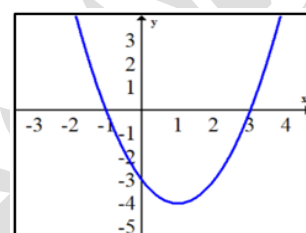
- A) -1 B) -2 C) 3 D) Does not exist

7. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$

- A) 3 B) 2 C) -1 D) -2

8. The figure on the right shows the graph of the derivative of the function f . which of the following is true ?

- A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
 C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$

9. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$

- A) -3 B) 3 C) -2 D) 2

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- A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$

11. The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$ 12. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$

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

13. Find the domain of the function $(f \circ g \circ h)_{(x)}$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$

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

14. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?

- A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None

15. Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$ A) $\frac{5}{2}$ B) 2 C) 6 D) 116. Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1

- A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$

17. $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$

- A) $(t - 1)^2$ B) $(t - 1)(t + 2)$ C) $(t - 2)(t + 1)$ D) None of them

18. Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x - 1}$

- A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
 C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x + 2)$

19. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.

- A) 3 B) 1 C) 2 D) -2

20. Find the range of the function $f(x) = \frac{1}{|x+3|}$ $\square$

- A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R

21. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$

- A) The function tends to $+\infty$ B) The function tends to $-\infty$
 C) The function tends to -2 D) The function tends to 0

22. Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)

- A) 3 B) e C) -1 D) 1

23. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$ A) $-\infty$ B) $+\infty$ C) -2 D) 224. If $e^y = -\sin x$, find y'

- A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

25. A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.

- A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s

26. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?

- A) 6 B) $\frac{7}{4}$ C) $\frac{-1}{2}$ D) $\frac{3}{2}$

27. Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$

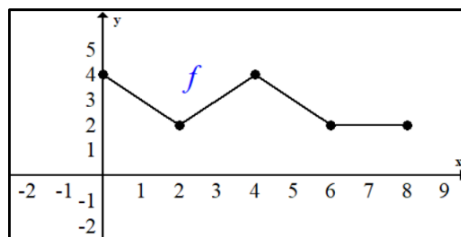
- A) $\lim_{x \rightarrow 2^-} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$

28. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$

- A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$

29. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

A) $\frac{11}{4}$ B) 22
C) $\frac{11}{8}$ D) $\frac{9}{4}$



30. Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$

A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$
C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$

31. Which of the following functions is symmetric with respect the origin ?

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

32. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$

A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$

33. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$

find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$

A) -2 B) 2 C) 4 D) -3

34. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$

A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2

35. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$

36. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

A) $]0, \frac{5\pi}{3}[$ B) $[\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $[\frac{4\pi}{3}, 2\pi[$

37. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$

A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2

38. Which of the following is true?

A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
B) If $f(a) = f(b)$ then $a = b$
C) If f is a rational function then it has at least one vertical asymptote.
D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$

39. Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$

A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
C) $\sin x - \cos x + c$ D) $\ln|\cos x + \sin x| + c$

40. Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$

A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$

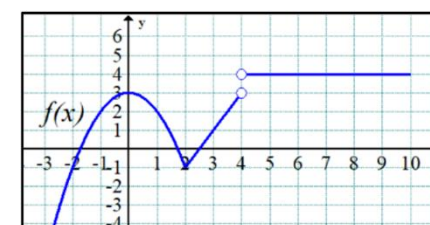
41. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)

A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$

42. Use the given graph on the right, to find

the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$

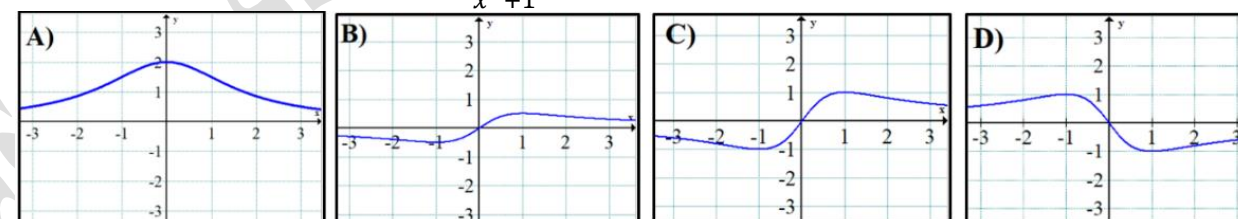
A) 4 B) -2
C) 1 D) 3



43. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$

A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$

44. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2+1}$



45. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x-1}$ are intersected at $x = -2$

A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them

46. Find the third derivative of the function $f(x) = x \ln x$

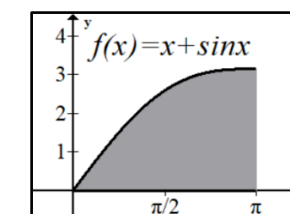
A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$

47. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :

A) $x^2 + 2\tan x + c$ B) $x^2 - 2\tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2\tan x + c$

48. Find the area of the shaded region where $f(x) = x + \sin x$

A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$



49. The result of $\int_0^2 x e^x dx$ is :

A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$

50. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2

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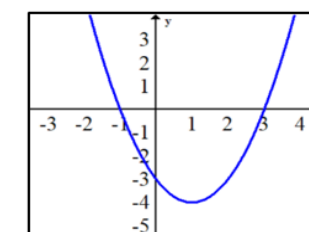
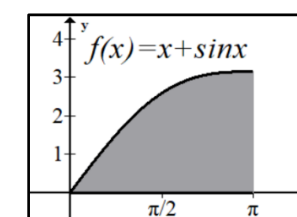
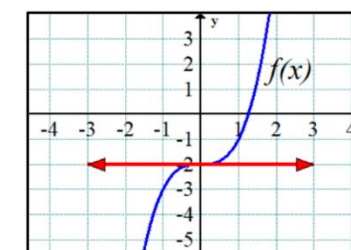
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Choose the correct option. (2 marks for each question)

- Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$
 A) $]-\infty, 2]$ B) $[2, +\infty[$ C) $[-2, +\infty[$ D) R
- Find the third derivative of the function $f(x) = x \ln x$
 A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$
- If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
 A) -1 B) -2 C) 3 D) Does not exist
- Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
 A) $]0, +\infty[$ B) $]-\infty, 0[$ C) $]4, +\infty[$ D) $]-\infty, 4[$
- The result of $\int_0^2 x e^x dx$ is :
 A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$
- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2-x-1}{x-1}$
 A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
 C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x + 2)$
- Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
 A) 1750 B) 1000 C) 1500 D) 1250
- Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$
 A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$
- Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2-bx+5}{x-1}$ are intersected at $x = -2$
 A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them
- Which of the following is true?
 A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
 B) If $f(a) = f(b)$ then $a = b$
 C) If f is a rational function then it has at least one vertical asymptote.
 D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$
- Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
 A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$
 C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$

- Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$
 A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$
- Find the range of the function $f(x) = \frac{1}{|x+3|}$
 A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R
- If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
 A) 6 B) $\frac{7}{4}$ C) $-\frac{1}{2}$ D) $\frac{3}{2}$
- Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$
 A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$
- Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2-3x+1}{x+1}$
 A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
- Which of the following functions is symmetric with respect the origin ?
 A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x+3}$
- Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$ A) $\frac{5}{2}$ B) 2 C) 6 D) 1
- The figure on the right shows the graph of a function $f(x)$
 Which of the following is true ?
 A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
 C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$
- Find the area of the shaded region where $f(x) = x + \sin x$
 A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
 C) $\frac{\pi^2+4}{2}$ D) $\frac{\pi^2}{2}$
- The figure on the right shows the graph of the derivative of the function f . which of the following is true ?
 A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
 C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$
- If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$
 A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$
- The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :
 A) $x^2 + 2 \tan x + c$ B) $x^2 - 2 \tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2 \tan x + c$
- $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$
 A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2
- Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$
 A) -3 B) 3 C) -2 D) 2



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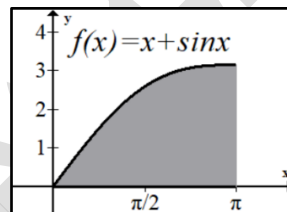
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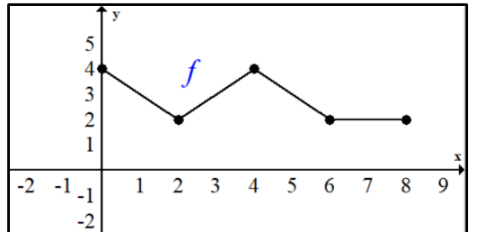
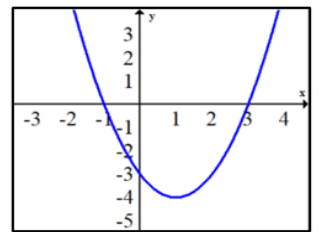
Choose the correct option. (2 marks for each question)

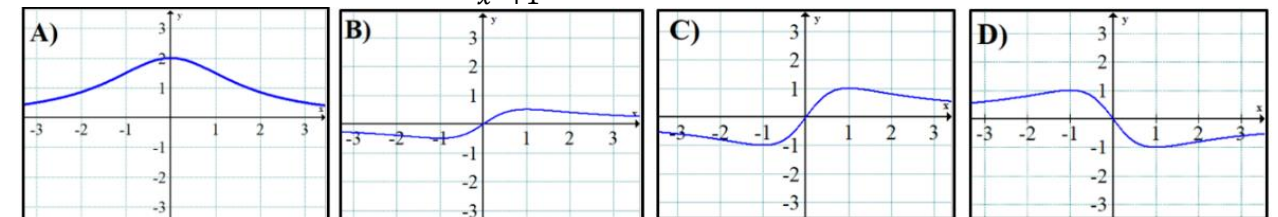
- Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.
 A) 3 B) 1 C) 2 D) -2
- Which of the following functions is symmetric with respect the origin ?
 A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x+3}$
- If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
 A) -1 B) -2 C) 3 D) Does not exist
- Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$ A) 3 B) 2 C) -1 D) -2
- Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$ A) $-\infty$ B) $+\infty$ C) -2 D) 2
- If $e^y = -\sin x$, find y'
 A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$
- Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2-3x+1}{x+1}$
 A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
- The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :
 A) $x^2 + 2 \tan x + c$ B) $x^2 - 2 \tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2 \tan x + c$
- The result of $\int_0^2 x e^x dx$ is :
 A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$
- What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$
 A) The function tends to $+\infty$ B) The function tends to $-\infty$
 C) The function tends to -2 D) The function tends to 0
- Use the given graph on the right, to find the result of $\frac{f(-1) - 2 \lim_{x \rightarrow 4^+} f(x)}{f(0)}$

 A) 4 B) -2
 C) 1 D) 3
- Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$ A) $\frac{5}{2}$ B) 2 C) 6 D) 1
- Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x-1}$ are intersected at $x = -2$
 A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them
- Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$
 A) $]0, \frac{5\pi}{3}[$ B) $]\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $]\frac{4\pi}{3}, 2\pi[$

- Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$
 A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
 C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$
- A point moves on the x-axis .The function $S(t) = t^2 - 6t + 5$ is the position function of this point , t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
 A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
- Find the third derivative of the function $f(x) = x \ln x$
 A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$
- Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
 A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
- Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$
 A) -3 B) 3 C) -2 D) 2
- Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$
 A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$
- $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$
 A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2
- At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?
 A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None
- Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$
 A) $]-\infty, 2]$ B) $[2, +\infty[$ C) $[-2, +\infty[$ D) $\mathbb{R}$
- Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
 A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$
- The figure on the right shows the graph of a function $f(x)$
 Which of the following is true ?
 A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
 C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$
- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x-1}$
 A) $x = 2, y = x + 1$ B) $x = 1, y = -x + 1$
 C) $x = -1, y = 2x - 1$ D) $x = 1, y = -(x + 2)$
- Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
 A) $]0, +\infty[$ B) $]-\infty, 0[$ C) $]4, +\infty[$ D) $]-\infty, 4[$
- Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$
 A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$

29. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$
- A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$
30. Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
- A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$
- C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
31. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2
32. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$
- A) -2 B) 2 C) 4 D) -3
33. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)
- A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
- C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$
34. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$
- A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$
35. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
- A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2
36. Find the range of the function $f(x) = \frac{1}{|x+3|}$
- A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R
37. If $\int_a^b f(x)dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$
- A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$
38. Find the area of the shaded region where $f(x) = x + \sin x$
- A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
- C) $\frac{\pi^2+4}{2}$ D) $\frac{\pi^2}{2}$
- 
39. $f(x) = x^2 + x - 2$ Which of the following equals $f(t-1)$
- A) $(t-1)^2$ B) $(t-1)(t+2)$ C) $(t-2)(t+1)$ D) None of them
40. The result of $\int_0^1 (x^2 + 1)^2 dx$ is: A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$
41. Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)
- A) 3 B) e C) -1 D) 1
42. Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$
- A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$

43. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
- A) 1750 B) 1000 C) 1500 D) 1250
44. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$
- A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$
45. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
- A) 6 B) $\frac{7}{4}$ C) $\frac{-1}{2}$ D) $\frac{3}{2}$
46. Which of the following is true?
- A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
- B) If $f(a) = f(b)$ then $a = b$
- C) If f is a rational function then it has at least one vertical asymptote.
- D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$
47. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$
- 
- A) $\frac{11}{4}$ B) 22
- C) $\frac{11}{8}$ D) $\frac{9}{4}$
48. The figure on the right shows the graph of the derivative of the function f . which of the following is true?
- 
- A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
- C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$
49. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$
- A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
- C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$
50. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2+1}$



SN: 000021

IN THE NAME OF ALLAH

Subject : Mathematics

Time : 3:30 hours

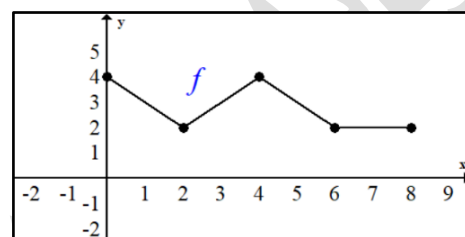


Fingerprint

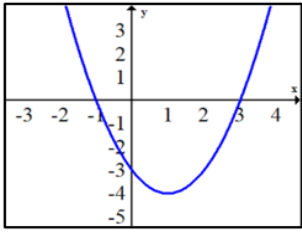
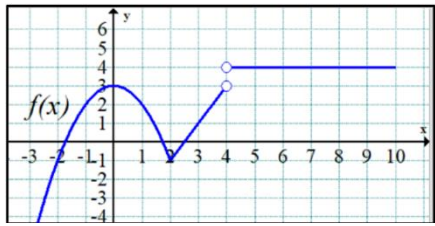
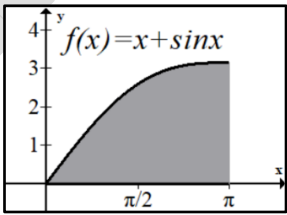
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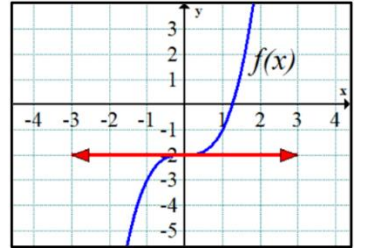
Choose the correct option. (2 marks for each question)

- Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2
- Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.
A) 3 B) 1 C) 2 D) -2
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$
A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$
- Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
A) 1750 B) 1000 C) 1500 D) 1250
- Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
- Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$
C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
- Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$
A) $]0, \frac{5\pi}{3}[$ B) $[\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $[\frac{4\pi}{3}, 2\pi[$
- Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$
A) $\frac{11}{4}$ B) 22
C) $\frac{11}{8}$ D) $\frac{9}{4}$
- Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$
A) -2 B) 2 C) 4 D) -3
- Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$ A) 3 B) 2 C) -1 D) -2
- Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$
A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
C) $\sin x - \cos x + c$ D) $\ln|\cos x + \sin x| + c$



- Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$
A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$
- $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$
A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2
- Which of the following is true?
A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
B) If $f(a) = f(b)$ then $a = b$
C) If f is a rational function then it has at least one vertical asymptote.
D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$
- Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$
- The result of $\int_0^2 x e^x dx$ is :
A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$
- The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$
- Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$ A) $\frac{5}{2}$ B) 2 C) 6 D) 1
- Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2+1}$
A) B) C) D)
- What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2
- If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
A) -1 B) -2 C) 3 D) Does not exist
- Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$
A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$
- Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)
A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$
- Find $F'(x)$ if $F(x) = \int_8^x t^3 \sqrt{t} dt$
A) $F'(x) = 8 - x^3 \sqrt{x}$ B) $F'(x) = x^3 \sqrt{x}$ C) $F'(x) = -x^3 \sqrt{x}$ D) $F'(x) = x^3 \sqrt{x} - 8$
- Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$
A) -3 B) 3 C) -2 D) 2

26. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
 A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$
27. If $\int_a^b f(x)dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$
 A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$
28. Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$
 A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$
29. $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$
 A) $(t - 1)^2$ B) $(t - 1)(t + 2)$ C) $(t - 2)(t + 1)$ D) None of them
30. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$
 A) The function tends to $+\infty$ B) The function tends to $-\infty$
 C) The function tends to -2 D) The function tends to 0
31. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?
 A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None
32. The figure on the right shows the graph of the derivative of the function f . which of the following is true ?
 A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
 C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$
- 
33. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$
 A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
34. Use the given graph on the right, to find the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$
 A) 4 B) -2
 C) 1 D) 3
- 
35. Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x - 1}$
 A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
 C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x + 2)$
36. Find the area of the shaded region where $f(x) = x + \sin x$
 A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
 C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$
- 
37. Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x + 1)}$ (Use L'Hôpital's rule)
 A) 3 B) e C) -1 D) 1
38. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x - 1}$ are intersected at $x = -2$
 A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them

39. A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
 A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
40. If $e^y = -\sin x$, find y'
 A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$
41. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
 A) 6 B) $\frac{7}{4}$ C) $-\frac{1}{2}$ D) $\frac{3}{2}$
42. Which of the following functions is symmetric with respect the origin ?
 A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x + 3}$
43. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$
 A) $f(x) = (x - 3)(x^2 + 4)$ B) $f(x) = (x + 3)(x^2 + 4)$
 C) $f(x) = (x - 3)(x^2 - 4)$ D) $f(x) = (x - 4)(x - 3)$
44. Which of the following is false for the function $f(x) = \begin{cases} 2x + 1 & -1 < x < 2 \\ 3 & x = 2 \\ 1 + x^2 & 2 < x < 4 \end{cases}$
 A) $\lim_{x \rightarrow 2^-} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$
45. The figure on the right shows the graph of a function $f(x)$. Which of the following is true ?
 A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
 C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$
- 
46. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$
 A) $] -\infty, 2]$ B) $[2, +\infty[$ C) $[-2, +\infty[$ D) $\mathbb{R}$
47. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x + 5}{(x - 3)^3}$
 A) $-\infty$ B) $+\infty$ C) -2 D) 2
48. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :
 A) $x^2 + 2 \tan x + c$ B) $x^2 - 2 \tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2 \tan x + c$
49. Find the range of the function $f(x) = \frac{1}{|x+3|}$ $\square$
 A) $\mathbb{R} - \{0\}$ B) $\mathbb{R} - \{-3\}$ C) $]0, +\infty[$ D) $\mathbb{R}$
50. Find the third derivative of the function $f(x) = x \ln x$
 A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $-\frac{2}{x^2}$ D) $-\frac{1}{x^2}$

SN: 000022

Fingerprint



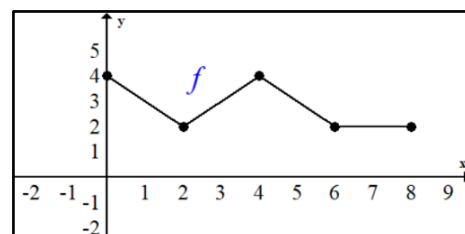
Choose the correct option. (2 marks for each question)

1. If $e^y = -\sin x$, find y'

- A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

2. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

- A) $\frac{11}{4}$ B) 22
C) $\frac{11}{8}$ D) $\frac{9}{4}$



3. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$

- A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$

4. Find the third derivative of the function $f(x) = x \ln x$

- A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$

5. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$

- A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$

6. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$

- A) -1 B) -2 C) 3 D) Does not exist

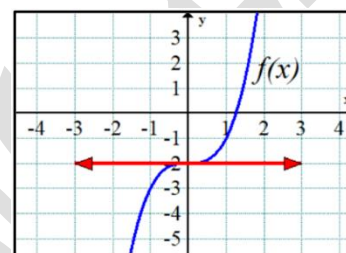
7. Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$

- A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$

8. The figure on the right shows the graph of a function $f(x)$

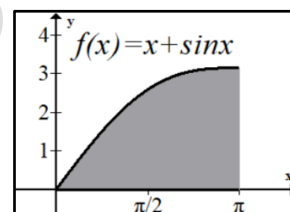
Which of the following is true ?

- A) $f''(0) < f''(1)$ B) $f'(0) < f'(-1)$
C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$



9. Find the area of the shaded region where $f(x) = x + \sin x$

- A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$



10. $f(x) = x^2 + x - 2$ Which of the following equals $f(t-1)$

- A) $(t-1)^2$ B) $(t-1)(t+2)$ C) $(t-2)(t+1)$ D) None of them

11. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x+1}$

- A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None

12. The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$

13. The result of $\int_0^2 x e^x dx$ is :

- A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$

14. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.

- A) 3 B) 1 C) 2 D) -2

15. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2

16. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$

- A) The function tends to $+\infty$ B) The function tends to $-\infty$
C) The function tends to -2 D) The function tends to 0

17. Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x-1}$

- A) $x = 2, y = x + 1$ B) $x = 1, y = -x + 1$
C) $x = -1, y = 2x - 1$ D) $x = 1, y = -(x + 2)$

18. Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)

- A) 3 B) e C) -1 D) 1

19. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$ A) $-\infty$ B) $+\infty$ C) -2 D) 2

20. Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$

- A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$

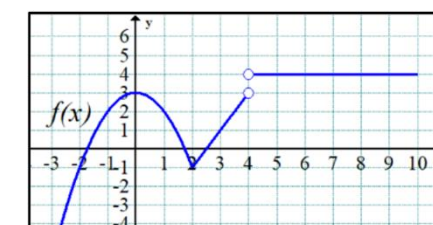
21. A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.

- A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s

22. Use the given graph on the right, to find

the result of $\frac{f(-1) - 2 \lim_{x \rightarrow 4^+} f(x)}{f(0)}$

- A) 4 B) -2
C) 1 D) 3



23. Find the range of the function $f(x) = \frac{1}{|x+3|}$

- A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R

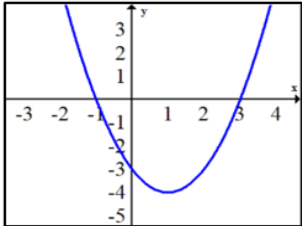
24. Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$ A) $\frac{5}{2}$ B) 2 C) 6 D) 1

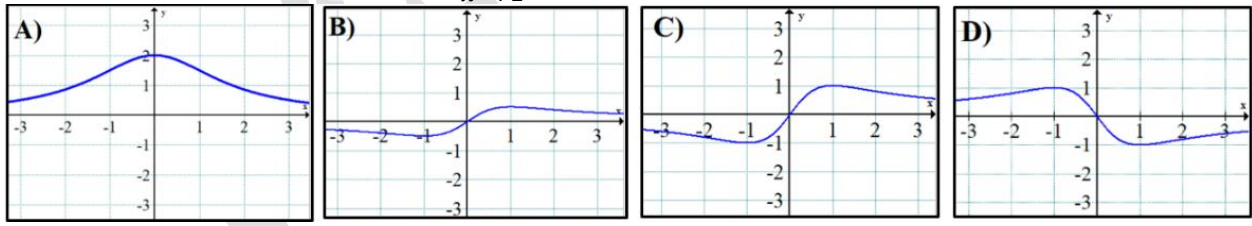
25. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

- A) $]0, \frac{5\pi}{3}[$ B) $]\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $]\frac{4\pi}{3}, 2\pi[$

26. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

- A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$

27. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$
 A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$
28. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$
 A) -2 B) 2 C) 4 D) -3
29. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
 A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$
30. Which of the following functions is symmetric with respect the origin ?
 A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x+3}$
31. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'\left(\frac{1}{2}\right)$
 A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2
32. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)
 A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
 C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$
33. Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$
 A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$
34. The figure on the right shows the graph of the derivative of the function f . which of the following is true ?
 A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
 C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$
- 
35. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
 A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2
36. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x-1}$ are intersected at $x = -2$
 A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them
37. If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$
 A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$
38. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
 A) 6 B) $\frac{7}{4}$ C) $-\frac{1}{2}$ D) $\frac{3}{2}$
39. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
 A) 1750 B) 1000 C) 1500 D) 1250
40. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$
 A) -3 B) 3 C) -2 D) 2

41. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :
 A) $x^2 + 2\tan x + c$ B) $x^2 - 2\tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2\tan x + c$
42. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?
 A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None
43. Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$
 A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
 C) $\sin x - \cos x + c$ D) $\ln|\cos x + \sin x| + c$
44. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2+1}$
- 
45. Which of the following is true?
 A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
 B) If $f(a) = f(b)$ then $a = b$
 C) If f is a rational function then it has at least one vertical asymptote.
 D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$
46. Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
 A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
47. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$
 A) $] -\infty, 2]$ B) $[2, +\infty[$ C) $[-2, +\infty[$ D) R
48. Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$
 A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$
49. Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
 A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$
 C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$
50. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$ A) 3 B) 2 C) -1 D) -2

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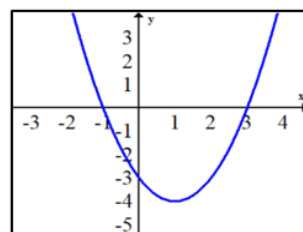


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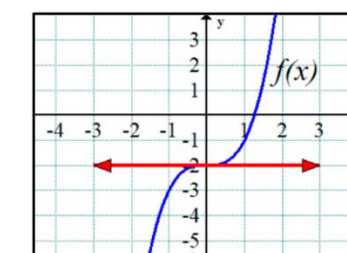
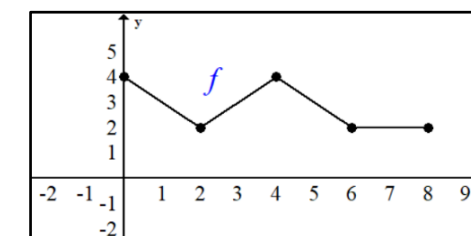
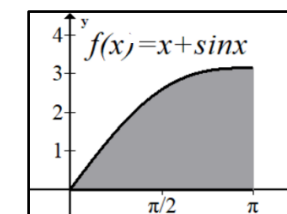
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Choose the correct option. (2 marks for each question)

- Find the result of $\int \left(\frac{1+\sin 2x}{\cos x + \sin x} \right) dx$
 A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
 C) $\sin x - \cos x + c$ D) $\ln|\cos x + \sin x| + c$
- If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
 A) 6 B) $\frac{7}{4}$ C) $\frac{-1}{2}$ D) $\frac{3}{2}$
- Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$
 A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$
- Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
 A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
- At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?
 A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None
- The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$
- Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$ A) $-\infty$ B) $+\infty$ C) -2 D) 2
- Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2
- Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$
 A) -2 B) 2 C) 4 D) -3
- $f(x) = x^2 + x - 2$ Which of the following equals $f(t-1)$
 A) $(t-1)^2$ B) $(t-1)(t+2)$ C) $(t-2)(t+1)$ D) None of them
- Which of the following is true?
 A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
 B) If $f(a) = f(b)$ then $a = b$
 C) If f is a rational function then it has at least one vertical asymptote.
 D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$
- The figure on the right shows the graph of the derivative of the function f . which of the following is true ?
 A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
 C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$



- Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$
 A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$
- Find the area of the shaded region where $f(x) = x + \sin x$
 A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
 C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$
- Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$
 A) $\frac{11}{4}$ B) 22
 C) $\frac{11}{8}$ D) $\frac{9}{4}$
- What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
 A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2
- Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$ A) $\frac{5}{2}$ B) 2 C) 6 D) 1
- Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$ A) 3 B) 2 C) -1 D) -2
- The figure on the right shows the graph of a function $f(x)$ Which of the following is true ?
 A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
 C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$
- Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.
 A) 3 B) 1 C) 2 D) -2
- Find the values of a and b if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
 A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$
- Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x+1}$
 A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
- $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$
 A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2
- The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :
 A) $x^2 + 2\tan x + c$ B) $x^2 - 2\tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2\tan x + c$
- Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
 A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$
- Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$
 A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$



27. If $e^y = -\sin x$, find y'

A) $y' = \tan x$

B) $y' = -\tan x$

C) $y' = \frac{1}{\tan x}$

D) $y' = \frac{-1}{\tan x}$

28. Use the given graph on the right, to find

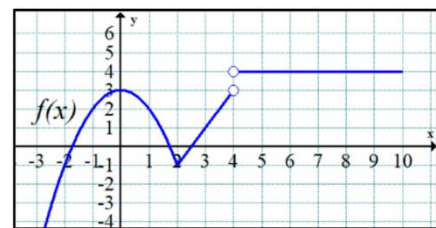
the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$

A) 4

B) -2

C) 1

D) 3



29. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

A) $f(x) = (x - 3)(x^2 + 4)$

B) $f(x) = (x + 3)(x^2 + 4)$

C) $f(x) = (x - 3)(x^2 - 4)$

D) $f(x) = (x - 4)(x - 3)$

30. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$

A) -3

B) 3

C) -2

D) 2

31. Which of the following is false for the function $f(x) = \begin{cases} 2x + 1 & -1 < x < 2 \\ 3 & x = 2 \\ 1 + x^2 & 2 < x < 4 \end{cases}$

A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$

B) $\lim_{x \rightarrow 0^+} f(x) = 0$

C) $\lim_{x \rightarrow 2^-} f(x) = 5$

D) $f(2) \neq 0$

32. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point $(2, 10)$

A) $F(x) = \frac{(10 - 4x^2)^3}{12} + 28$

B) $F(x) = \frac{(10 - 4x^2)^3}{12} - 28$

C) $F(x) = \frac{-(10 - 4x^2)^3}{12} + 8$

D) $F(x) = \frac{-(10 - 4x^2)^3}{12} - 8$

33. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$

A) $\frac{\sin x}{2 + \cos^2 x}$

B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$

C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$

D) $\frac{-\sin 2x}{2 + \cos^2 x}$

34. Find the range of the function $f(x) = \frac{1}{|x+3|}$

A) $R - \{0\}$

B) $R - \{-3\}$

C) $]0, +\infty[$

D) R

35. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x} - 2} \leq f(x) \leq \frac{x^2}{1 - \cos 2x}$

A) 2

B) $\frac{1}{4}$

C) -2

D) $\frac{1}{2}$

36. Which of the following functions is symmetric with respect the origin?

A) $f(x) = |x|$

B) $f(x) = \cos^3 x$

C) $f(x) = x \sin^2 x$

D) $f(x) = 1 - \sqrt{x+3}$

37. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

A) $]0, \frac{5\pi}{3}[$

B) $]\frac{2\pi}{3}, \frac{4\pi}{3}[$

C) $]0, \frac{2\pi}{3}[$

D) $]\frac{4\pi}{3}, 2\pi[$

38. Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x - 1}$

A) $x = 2$, $y = x + 1$

B) $x = 1$, $y = -x + 1$

C) $x = -1$, $y = 2x - 1$

D) $x = 1$, $y = -(x + 2)$

39. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$

A) The function tends to $+\infty$

B) The function tends to $-\infty$

C) The function tends to -2

D) The function tends to 0

40. The result of $\int_0^2 x e^x dx$ is:

A) e^2

B) $e^2 - 1$

C) $e^2 + 1$

D) $\frac{e^2}{2} + 2$

41. Which of the following functions is discontinuous at $x = 2$ and it has a non-removable

discontinuity at $x = 2$

A) $f(x) = \frac{x^2 - 16}{2x - 4}$

B) $f(x) = \frac{4x - 16}{4x^2 - 8}$

C) $f(x) = \begin{cases} \frac{x^2 - 4}{4 - 2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$

D) $f(x) = \begin{cases} \frac{4x^2 - 16}{4 - 2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$

42. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$

A) -1

B) -2

C) 3

D) Does not exist

43. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100

A) 1750

B) 1000

C) 1500

D) 1250

44. If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$

A) $6b - 3a$

B) $6b + 3a$

C) $4b - a$

D) $a + 2b + 4$

45. Find the third derivative of the function $f(x) = x \ln x$

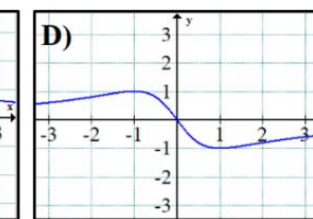
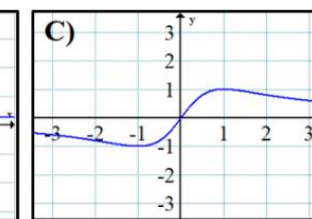
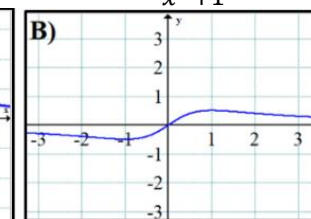
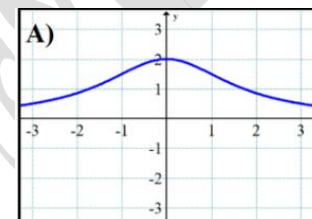
A) $\frac{1}{x}$

B) $\frac{2}{x^2}$

C) $\frac{-2}{x^2}$

D) $\frac{-1}{x^2}$

46. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2 + 1}$



47. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$

A) $]-\infty, 2]$

B) $[2, +\infty[$

C) $[-2, +\infty[$

D) R

48. A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.

A) -2 m/s

B) 4 m/s

C) 1 m/s

D) -3 m/s

49. Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)

A) 3

B) e

C) -1

D) 1

50. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x - 1}$ are intersected at $x = -2$

A) 2

B) $-\frac{9}{4}$

C) $\frac{9}{4}$

D) None of them



Choose the correct option. (2 marks for each question)

1. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)

A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$

2. A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.

A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s

3. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection?

A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None

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

A) $\frac{5}{2}$ B) 2 C) 6 D) 1

5. The result of $\int_0^2 x e^x dx$ is:

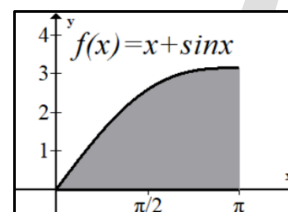
A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$

6. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$

A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2

7. Find the area of the shaded region where $f(x) = x + \sin x$

A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$



8. Find $F'(x)$ if $F(x) = \int_8^x t^3 \sqrt{t} dt$

A) $F'(x) = 8 - x^3 \sqrt{x}$ B) $F'(x) = x^3 \sqrt{x}$ C) $F'(x) = -x^3 \sqrt{x}$ D) $F'(x) = x^3 \sqrt{x} - 8$

9. Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$

A) $a = \frac{1}{2}, b = -2$ B) $a = \frac{1}{3}, b = 2$ C) $a = \frac{1}{2}, b = 2$ D) $a = \frac{1}{3}, b = -3$

10. Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$

find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$

A) -2 B) 2 C) 4 D) -3

11. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$

A) -1 B) -2 C) 3 D) Does not exist

12. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$

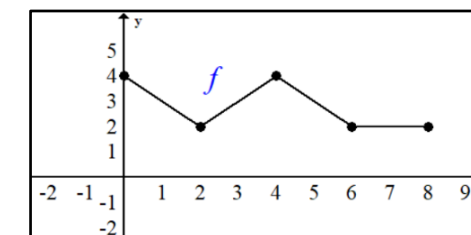
A) 3 B) 2 C) -1 D) -2

13. Which of the following is true?

A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
B) If $f(a) = f(b)$ then $a = b$
C) If f is a rational function then it has at least one vertical asymptote.
D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$

14. Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

A) $\frac{11}{4}$ B) 22
C) $\frac{11}{8}$ D) $\frac{9}{4}$



15. Find the range of the function $f(x) = \frac{1}{|x+3|}$

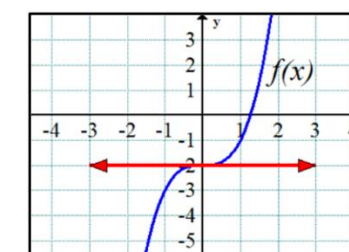
A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R

16. Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100

A) 1750 B) 1000 C) 1500 D) 1250

17. The figure on the right shows the graph of a function $f(x)$. Which of the following is true?

A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$



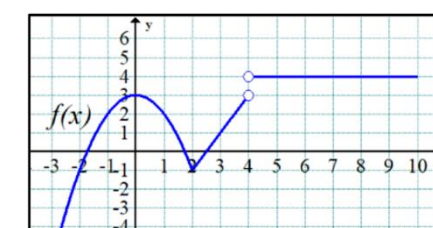
18. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$

A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$

19. Use the given graph on the right, to find

the result of $\frac{f(-1) - 2 \lim_{x \rightarrow 4^+} f(x)}{f(0)}$

A) 4 B) -2
C) 1 D) 3



20. If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$

A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$

21. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

A) $f(x) = (x-3)(x^2+4)$ B) $f(x) = (x+3)(x^2+4)$
C) $f(x) = (x-3)(x^2-4)$ D) $f(x) = (x-4)(x-3)$

22. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$

A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2

23. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$

A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$

24. Which of the following functions is symmetric with respect the origin ?

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

25. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :

- A) $x^2 + 2 \tan x + c$ B) $x^2 - 2 \tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2 \tan x + c$

26. Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x+1}$

- A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None

27. Find the result of $\int (\frac{1 + \sin 2x}{\cos x + \sin x}) dx$

- A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
C) $\sin x - \cos x + c$ D) $\ln |\cos x + \sin x| + c$

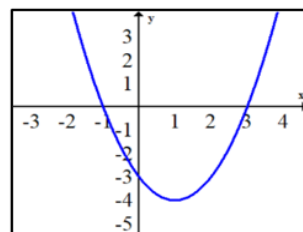
28. Find the result of $\lim_{x \rightarrow 3} \frac{-2x+5}{(x-3)^3}$ A) $-\infty$ B) $+\infty$ C) -2 D) 2

29. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

- A) $]0, \frac{5\pi}{3}[$ B) $[\frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $[\frac{4\pi}{3}, 2\pi[$

30. The figure on the right shows the graph of the derivative of the function f . which of the following is true ?

- A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$



31. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, -\frac{1}{2})$ then find $f'(0)$?

- A) 6 B) $\frac{7}{4}$ C) $-\frac{1}{2}$ D) $\frac{3}{2}$

32. The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$

33. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.

- A) 3 B) 1 C) 2 D) -2

34. Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$

- A) $f(x) = \frac{x^2-16}{2x-4}$ B) $f(x) = \frac{4x-16}{4x^2-8}$
C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$

35. Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1

- A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$

36. Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$

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

37. If $e^y = -\sin x$, find y'

- A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

38. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$

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

39. Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)

- A) 3 B) e C) -1 D) 1

40. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$

- A) -3 B) 3 C) -2 D) 2

41. Which of the following is false for the function $f(x) = \begin{cases} 2x+1 & -1 < x < 2 \\ 3 & x = 2 \\ 1+x^2 & 2 < x < 4 \end{cases}$

- A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$

42. Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$

- A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$

43. Find the third derivative of the function $f(x) = x \ln x$

- A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$

44. $f(x) = x^2 + x - 2$ Which of the following equals $f(t-1)$

- A) $(t-1)^2$ B) $(t-1)(t+2)$ C) $(t-2)(t+1)$ D) None of them

45. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$

- A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$

46. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2

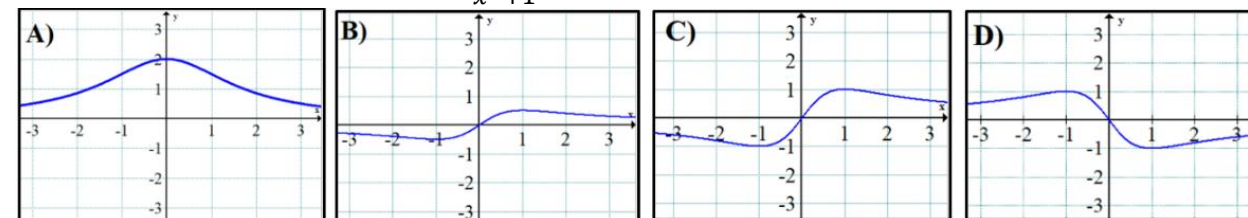
47. Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x-1}$

- A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x + 2)$

48. What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$

- A) The function tends to $+\infty$ B) The function tends to $-\infty$
C) The function tends to -2 D) The function tends to 0

49. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2+1}$



50. Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x-1}$ are intersected at $x = -2$

- A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them

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Fingerprint

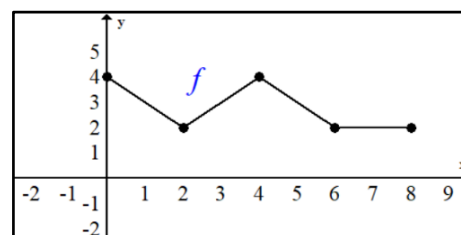
Y

Choose the correct option. (2 marks for each question)

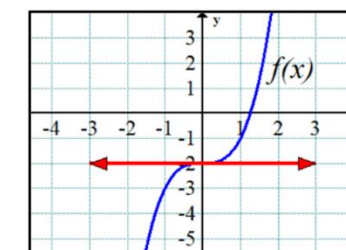
- Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$
 A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$
- Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x - 1}$ are intersected at $x = -2$
 A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them
- Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$
 A) $]-\infty, 2]$ B) $[2, +\infty[$ C) $[-2, +\infty[$ D) R
- $f(x) = x^2 + x - 2$ Which of the following equals $f(t - 1)$
 A) $(t - 1)^2$ B) $(t - 1)(t + 2)$ C) $(t - 2)(t + 1)$ D) None of them
- Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
 A) 1750 B) 1000 C) 1500 D) 1250
- What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
 A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2
- What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$
 A) The function tends to $+\infty$ B) The function tends to $-\infty$
 C) The function tends to -2 D) The function tends to 0
- If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
 A) 6 B) $\frac{7}{4}$ C) $-\frac{1}{2}$ D) $\frac{3}{2}$
- Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x} - 2} \leq f(x) \leq \frac{x^2}{1 - \cos 2x}$
 A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$
- Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
 A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$
- The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$

- Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$

- A) $\frac{11}{4}$ B) 22
 C) $\frac{11}{8}$ D) $\frac{9}{4}$



- Which of the following is false for the function $f(x) = \begin{cases} 2x + 1 & -1 < x < 2 \\ 3 & x = 2 \\ 1 + x^2 & 2 < x < 4 \end{cases}$
 A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$
- The figure on the right shows the graph of a function $f(x)$. Which of the following is true?
 A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
 C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$
- Which of the following functions is symmetric with respect the origin?
 A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x + 3}$
- Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$ A) $-\infty$ B) $+\infty$ C) -2 D) 2
- If $e^y = -\sin x$, find y'
 A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$
- Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$
 A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$
- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x - 1}$
 A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
 C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x + 2)$
- Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$
 A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
- The result of $\int_0^2 x e^x dx$ is :
 A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$
- Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$
 A) -2 B) 2 C) 4 D) -3
- A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
 A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s
- Which of the following is true?
 A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
 B) If $f(a) = f(b)$ then $a = b$
 C) If f is a rational function then it has at least one vertical asymptote.
 D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$
- Find the range of the function $f(x) = \frac{1}{|x+3|}$
 A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R



26. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)

A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$

B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$

C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$

D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$

27. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection?

A) $x = 0$

B) $x = 1$

C) $x = 2$

D) None

28. The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :

A) $x^2 + 2\tan x + c$

B) $x^2 - 2\tan x + c$

C) $x^2 + \tan 2x + c$

D) $2x + 2\tan x + c$

29. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$

A) 3

B) 2

C) -1

D) -2

30. Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$

A) $\sin x + \cos x + c$

B) $-\sin x - \cos x + c$

C) $\sin x - \cos x + c$

D) $\ln|\cos x + \sin x| + c$

31. Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$

A) $f(x) = \frac{x^2-16}{2x-4}$

B) $f(x) = \frac{4x-16}{4x^2-8}$

C) $f(x) = \begin{cases} \frac{x^2-4}{4-2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$

D) $f(x) = \begin{cases} \frac{4x^2-16}{4-2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$

32. Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no points of discontinuity.

A) 3

B) 1

C) 2

D) -2

33. Find the third derivative of the function $f(x) = x \ln x$

A) $\frac{1}{x}$

B) $\frac{2}{x^2}$

C) $\frac{-2}{x^2}$

D) $\frac{-1}{x^2}$

34. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$

A) $]0, +\infty[$

B) $] -\infty, 0[$

C) $]4, +\infty[$

D) $] -\infty, 4[$

35. Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$

A) $a = \frac{1}{2}, b = -2$

B) $a = \frac{1}{3}, b = 2$

C) $a = \frac{1}{2}, b = 2$

D) $a = \frac{1}{3}, b = -3$

36. Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$

A) -3

B) 3

C) -2

D) 2

37. Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$

A) $y = x + \pi$

B) $y = -x - 1 + \pi$

C) $y = x + 1 + \pi$

D) $y = x - \pi$

38. Find the result of $\lim_{x \rightarrow 0} \frac{\sin 3x + \tan 2x}{2x}$

A) $\frac{5}{2}$

B) 2

C) 6

D) 1

39. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$

A) $]0, \frac{5\pi}{3}[$

B) $] \frac{2\pi}{3}, \frac{4\pi}{3}[$

C) $]0, \frac{2\pi}{3}[$

D) $] \frac{4\pi}{3}, 2\pi[$

40. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$

A) $\frac{\sin x}{2 + \cos^2 x}$

B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$

C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$

D) $\frac{-\sin 2x}{2 + \cos^2 x}$

41. Use the given graph on the right, to find

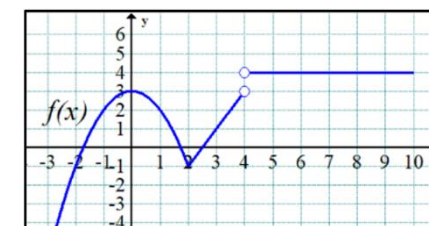
the result of $\frac{f(-1) - 2 \lim_{x \rightarrow 4^+} f(x)}{f(0)}$

A) 4

B) -2

C) 1

D) 3



42. Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x} - 1}{\ln(x+1)}$ (Use L'Hôpital's rule)

A) 3

B) e

C) -1

D) 1

43. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$

A) 3

B) 0

C) 4

D) 2

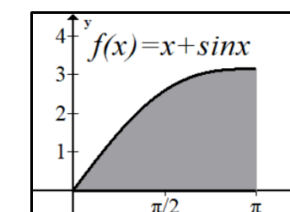
44. Find the area of the shaded region where $f(x) = x + \sin x$

A) $\pi^2 + 1$

B) $\frac{\pi^2}{2} + 1$

C) $\frac{\pi^2 + 4}{2}$

D) $\frac{\pi^2}{2}$



45. Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$

A) $f(x) = (x - 3)(x^2 + 4)$

B) $f(x) = (x + 3)(x^2 + 4)$

C) $f(x) = (x - 3)(x^2 - 4)$

D) $f(x) = (x - 4)(x - 3)$

46. If $\int_a^b f(x) dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$

A) $6b - 3a$

B) $6b + 3a$

C) $4b - a$

D) $a + 2b + 4$

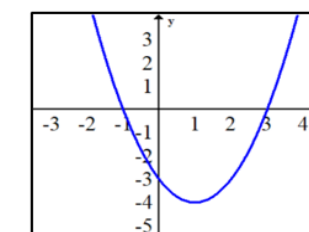
47. The figure on the right shows the graph of the derivative of the function f . which of the following is true?

A) $f(2) < f(1) < f(0)$

B) $f(1) < f(2) < f(0)$

C) $f(0) < f(1) < f(2)$

D) $f(2) = f(1) = f(0)$



48. If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$

A) -1

B) -2

C) 3

D) Does not exist

49. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$

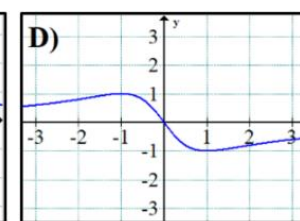
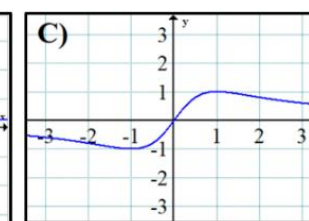
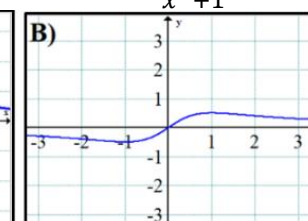
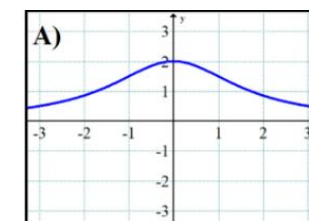
A) $\frac{7}{2}$

B) $\frac{5}{2}$

C) $\frac{3}{2}$

D) 2

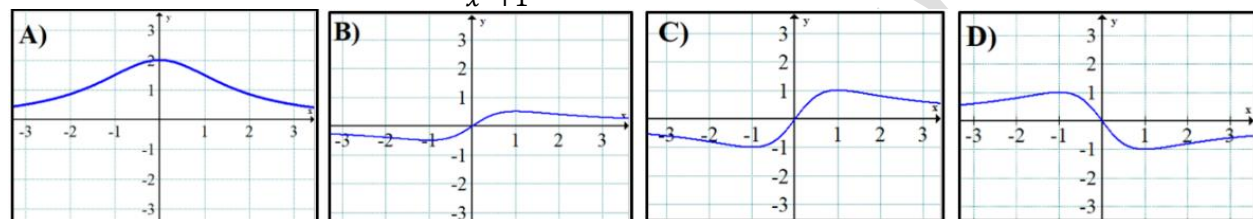
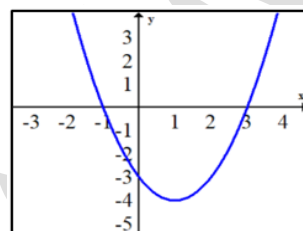
50. Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2+1}$



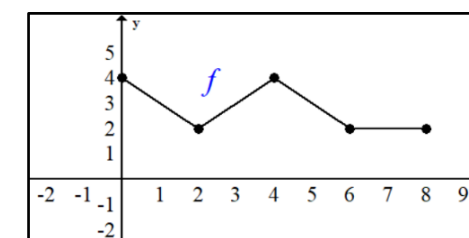


Choose the correct option. (2 marks for each question)

- Find the value of b where the two functions $f(x) = 3x - 2b$ and $g(x) = \frac{x^2 - bx + 5}{x - 1}$ are intersected at $x = -2$
A) 2 B) $-\frac{9}{4}$ C) $\frac{9}{4}$ D) None of them
- Find the third derivative of the function $f(x) = x \ln x$
A) $\frac{1}{x}$ B) $\frac{2}{x^2}$ C) $\frac{-2}{x^2}$ D) $\frac{-1}{x^2}$
- The result of $\int (2x + \frac{2}{\cos^2 x}) dx$ is :
A) $x^2 + 2 \tan x + c$ B) $x^2 - 2 \tan x + c$ C) $x^2 + \tan 2x + c$ D) $2x + 2 \tan x + c$
- Find the domain of the function $(f \circ g \circ h)(x)$ where $f(x) = \sqrt{x}$, $g(x) = 3x$ and $h(x) = x - 2$
A) $]-\infty, 2]$ B) $[2, +\infty[$ C) $[-2, +\infty[$ D) R
- Which of the following functions is symmetric with respect the origin ?
A) $f(x) = |x|$ B) $f(x) = \cos^3 x$ C) $f(x) = x \sin^2 x$ D) $f(x) = 1 - \sqrt{x + 3}$
- Find the value of $(a^2 + 2)$ so that the function $f(x) = \begin{cases} ax^2 + 1 & x \leq -1 \\ ax^3 + 3 & x > -1 \end{cases}$ have no pions of discontinuity.
A) 3 B) 1 C) 2 D) -2
- Find the value of k so that the function $f(x) = kx^3 - 1$ passes through the point $(-1, 2)$
A) -3 B) 3 C) -2 D) 2
- If $f(x) = \frac{-2x-2}{|x+1|}$ and $g(x) = \frac{|x+1|}{x+1}$ then find the result of $\lim_{x \rightarrow -1} [f(x)g(x)]$
A) -1 B) -2 C) 3 D) Does not exist
- The figure on the right shows the graph of the derivative of the function f . which of the following is true ?
A) $f(2) < f(1) < f(0)$ B) $f(1) < f(2) < f(0)$
C) $f(0) < f(1) < f(2)$ D) $f(2) = f(1) = f(0)$
- Use the intercepts, symmetry, asymptotes, first and second derivative test to determine the graph of the function $f(x) = \frac{2x}{x^2 + 1}$
A) B) C) D)
- Which of the following functions is discontinuous at $x = 2$ and it has a non-removable discontinuity at $x = 2$
A) $f(x) = \frac{x^2 - 16}{2x - 4}$ B) $f(x) = \frac{4x - 16}{4x^2 - 8}$
C) $f(x) = \begin{cases} \frac{x^2 - 4}{4 - 2x} & x \neq 2 \\ -2 & x = 2 \end{cases}$ D) $f(x) = \begin{cases} \frac{4x^2 - 16}{4 - 2x} & x \neq 2 \\ 4 & x = 2 \end{cases}$



- What is the behavior of the function $f(x) = 2x^4 + 5x^7 + 8$ when x tends to $-\infty$
A) The function tends to $+\infty$ B) The function tends to $-\infty$
C) The function tends to -2 D) The function tends to 0
- Find the vertical and slant asymptotes of the function $f(x) = \frac{-x^2 - x - 1}{x - 1}$
A) $x = 2$, $y = x + 1$ B) $x = 1$, $y = -x + 1$
C) $x = -1$, $y = 2x - 1$ D) $x = 1$, $y = -(x + 2)$
- Find the equation of the tangent line to the graph of the curve $x + 1 = \tan y$ at $y = \pi$
A) $y = x + \pi$ B) $y = -x - 1 + \pi$ C) $y = x + 1 + \pi$ D) $y = x - \pi$
- Find the values of a and b , if $f(x) = ax^3 + bx^2 - 3$ knowing that $f'(-2) = 16$ and $f''(1) = -4$
A) $a = \frac{1}{2}$, $b = -2$ B) $a = \frac{1}{3}$, $b = 2$ C) $a = \frac{1}{2}$, $b = 2$ D) $a = \frac{1}{3}$, $b = -3$
- Assume that x and y are two differentiable functions of a variable t , if $x^2 + y^2 = 13$ find $\frac{dy}{dt}$, where $\frac{dx}{dt} = 2$ and $x = 3$, $y = 2$
A) -2 B) 2 C) 4 D) -3
- The result of $\int_0^1 (x^2 + 1)^2 dx$ is : A) $\frac{1}{12}$ B) $\frac{1}{15}$ C) $\frac{28}{15}$ D) $\frac{5}{12}$
- Write the equation of the function whose x-intercepts are $x = 2$, $x = -2$ and $x = 3$
A) $f(x) = (x - 3)(x^2 + 4)$ B) $f(x) = (x + 3)(x^2 + 4)$
C) $f(x) = (x - 3)(x^2 - 4)$ D) $f(x) = (x - 4)(x - 3)$
- Which of the following is true?
A) $\lim_{x \rightarrow 0} \frac{|x|}{x} = 1$
B) If $f(a) = f(b)$ then $a = b$
C) If f is a rational function then it has at least one vertical asymptote.
D) If $f(x) = g(x)$ for all x except for $x = 0$ and $\lim_{x \rightarrow 0} f(x) = L$ then $\lim_{x \rightarrow 0} g(x) = L$
- Use the figure on the right to find the mean value of the function f over the interval $[0, 8]$
A) $\frac{11}{4}$ B) 22
C) $\frac{11}{8}$ D) $\frac{9}{4}$
- Which of the following is false for the function $f(x) = \begin{cases} 2x + 1 & -1 < x < 2 \\ 3 & x = 2 \\ 1 + x^2 & 2 < x < 4 \end{cases}$
A) $\lim_{x \rightarrow 2} f(x) \neq f(1)$ B) $\lim_{x \rightarrow 0^+} f(x) = 0$ C) $\lim_{x \rightarrow 2^-} f(x) = 5$ D) $f(2) \neq 0$
- Find the equation of the horizontal asymptote of the function $f(x) = \frac{4x^2 - 3x + 1}{x + 1}$
A) $y = 0$ B) $y = 4$ C) $y = 2$ D) None
- Find the maximum product of two positive numbers such that the sum of the first and twice the second is 100
A) 1750 B) 1000 C) 1500 D) 1250
- Find the range of the function $f(x) = \frac{1}{|x + 3|}$ $\square$
A) $R - \{0\}$ B) $R - \{-3\}$ C) $]0, +\infty[$ D) R



25. Find the result of $\lim_{x \rightarrow 0} \frac{-x}{\sqrt{x+1}-1}$ A) 3 B) 2 C) -1 D) -2

26. Find the interval on which the graph of the function is concave $f(x) = x + \frac{2}{x}$
A) $]0, +\infty[$ B) $] -\infty, 0[$ C) $]4, +\infty[$ D) $] -\infty, 4[$

27. If the function $f(x) = \frac{2x-1}{3x+b}$ has y-intercept at the point $(0, \frac{-1}{2})$ then find $f'(0)$?
A) 6 B) $\frac{7}{4}$ C) $\frac{-1}{2}$ D) $\frac{3}{2}$

28. What is value of k when the function $f(x) = \frac{1}{3}x^3 - x + k$ has horizontal tangent at $x = k - 1$
A) -1 and 1 B) 0 and 1 C) 0 and 2 D) 0 and -2

29. Find the result of $\lim_{x \rightarrow +\infty} (2 + \frac{\cos 2x}{x})$ A) 3 B) 0 C) 4 D) 2

30. Find the result of $\lim_{x \rightarrow 3^-} \frac{-2x+5}{(x-3)^3}$ A) $-\infty$ B) $+\infty$ C) -2 D) 2

31. Use the squeeze theorem to find $\lim_{x \rightarrow 0} f(x)$ where $\frac{2x}{2e^{2x}-2} \leq f(x) \leq \frac{x^2}{1-\cos 2x}$
A) 2 B) $\frac{1}{4}$ C) -2 D) $\frac{1}{2}$

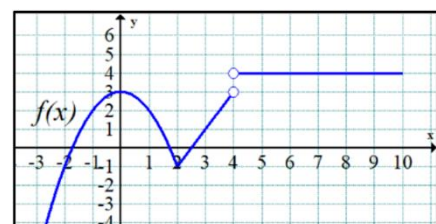
32. If $e^y = -\sin x$, find y'
A) $y' = \tan x$ B) $y' = -\tan x$ C) $y' = \frac{1}{\tan x}$ D) $y' = \frac{-1}{\tan x}$

33. Find $F'(x)$ if $F(x) = \int_8^x t \sqrt[3]{t} dt$
A) $F'(x) = 8 - x \sqrt[3]{x}$ B) $F'(x) = x \sqrt[3]{x}$ C) $F'(x) = -x \sqrt[3]{x}$ D) $F'(x) = x \sqrt[3]{x} - 8$

34. A point moves on the x-axis. The function $S(t) = t^2 - 6t + 5$ is the position function of this point, t is measured in second and S in meters. Find the average velocity of this point during the first four seconds.
A) -2 m/s B) 4 m/s C) 1 m/s D) -3 m/s

35. At which value of x the graph of the function $f(x) = 2x^4 - 6x + 1$ has a point of inflection ?
A) $x = 0$ B) $x = 1$ C) $x = 2$ D) None

36. Use the given graph on the right, to find the result of $\frac{f(-1) - 2\lim_{x \rightarrow 4^+} f(x)}{f(0)}$



A) 4 B) -2
C) 1 D) 3

37. $f(x) = x^2 + x - 2$ Which of the following equals $f(t-1)$
A) $(t-1)^2$ B) $(t-1)(t+2)$ C) $(t-2)(t+1)$ D) None of them

38. Find the value of a if the slope of the line passing through the points $(\frac{-1}{3}, a)$, $(\frac{-2}{3}, \frac{4}{5})$ is -1
A) 15 B) $\frac{17}{16}$ C) $\frac{9}{5}$ D) $\frac{7}{15}$

39. If $\int_a^b f(x)dx = a + 2b$ then find the value of $\int_a^b [f(x) + 4] dx$
A) $6b - 3a$ B) $6b + 3a$ C) $4b - a$ D) $a + 2b + 4$

40. $f(x) = 3x - \frac{x^2}{2}$ which of the following is $f'(\frac{1}{2})$
A) $\frac{7}{2}$ B) $\frac{5}{2}$ C) $\frac{3}{2}$ D) 2

41. Find the decreasing interval of the function $f(x) = \frac{1}{2}x + \sin x$ in the interval $]0, 2\pi[$
A) $]0, \frac{5\pi}{3}[$ B) $] \frac{2\pi}{3}, \frac{4\pi}{3}[$ C) $]0, \frac{2\pi}{3}[$ D) $] \frac{4\pi}{3}, 2\pi[$

42. Find the result of $\int (\frac{1+\sin 2x}{\cos x + \sin x}) dx$
A) $\sin x + \cos x + c$ B) $-\sin x - \cos x + c$
C) $\sin x - \cos x + c$ D) $\ln|\cos x + \sin x| + c$

43. Find the derivative of the function $f(x) = \ln \sqrt{2 + \cos^2 x}$
A) $\frac{\sin x}{2 + \cos^2 x}$ B) $\frac{-\sin 2x}{2(2 + \cos^2 x)}$ C) $\frac{-\sin 2x}{\sqrt{2 + \cos^2 x}}$ D) $\frac{-\sin 2x}{2 + \cos^2 x}$

44. Find the antiderivative of the function $f(x) = 2x(10 - 4x^2)^2$ whose graph passes through the point (2,10)

A) $F(x) = \frac{(10-4x^2)^3}{12} + 28$ B) $F(x) = \frac{(10-4x^2)^3}{12} - 28$
C) $F(x) = \frac{-(10-4x^2)^3}{12} + 8$ D) $F(x) = \frac{-(10-4x^2)^3}{12} - 8$

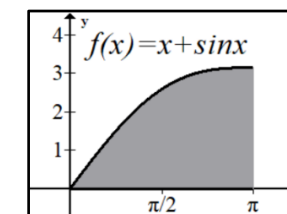
45. Find the limit of $\lim_{x \rightarrow 0} \frac{e^{-x}-1}{\ln(x+1)}$ (Use L'Hôpital's rule)
A) 3 B) e C) -1 D) 1

46. The result of $\int_0^2 x e^x dx$ is :

A) e^2 B) $e^2 - 1$ C) $e^2 + 1$ D) $\frac{e^2}{2} + 2$

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

48. Find the area of the shaded region where $f(x) = x + \sin x$
A) $\pi^2 + 1$ B) $\frac{\pi^2}{2} + 1$
C) $\frac{\pi^2 + 4}{2}$ D) $\frac{\pi^2}{2}$



49. Find the distance between the graph of the point of the intersection of the two functions $f(x) = -x$, $g(x) = \sqrt{x}$ and the line $y = 2x - 1$
A) 1 B) $\frac{\sqrt{5}}{5}$ C) $\frac{2}{\sqrt{5}}$ D) $\sqrt{5}$

50. The figure on the right shows the graph of a function $f(x)$ Which of the following is true ?

A) $f''(0) < f''(1)$ B) $f'(0) < f''(-1)$
C) $f(-1) > f(1)$ D) $f'(-1) + f'(1) < 0$

