

Practice Session on Calculus - Part VI

Revision Course on Engineering Mathematics - GATE, CS & IT

CALCULUS DPP

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$$1. \lim_{x \rightarrow 0} \frac{x(e^x - 1) + 2(\cos x - 1)}{x(1 - \cos x)} = \underline{\hspace{2cm}}$$

(GATE -ME- 1993)

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2. The integration of $\int \log x \, dx$ has the value (GATE -EC- 1994)

- (a) $(x \log x - 1)$
- (b) $\log x - x$
- (c) $x (\log x - 1)$
- (d) None of the above

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3. $\lim_{n \rightarrow \infty} (\sqrt{n^2 + n} - \sqrt{n^2 + 1})$ is _____.

(GATE-16-IN)

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$$4. \lim_{x \rightarrow \infty} \frac{x^3 - \cos x}{x^2 + (\sin x)^2} = \underline{\hspace{2cm}}$$

(GATE -CS- 1995)

- (a) ∞
- (b) 0
- (c) 2
- (d) Does not exist

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5. $\lim_{x \rightarrow 0} x \sin \frac{1}{x} = \underline{\hspace{2cm}}$ (GATE -CS- 1995)
- (a) ∞ (b) 0 (c) 1 (d) Does not exist

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6. The function $f(x) = |x+1|$ on the interval $[-2, 0]$ is _____

(GATE-EC- 1995)

- (a) continuous and differentiable
- (b) continuous on the interval but not differentiable at all points
- (c) Neither continuous nor differentiable
- (d) Differentiable but not continuous

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7. If a function is continuous at a point its first derivative (GATE -EC- 1995)

- (a) may or may not exist
- (b) exists always
- (c) will not exist
- (d) has a unique value

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8. $\lim_{\theta \rightarrow 0} \frac{\sin m\theta}{\theta}$, where m is an integer, is one of the following:

(GATE -CS- 1997)

- (a) m
- (b) $m\pi$
- (c) $m\theta$
- (d) 1

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9. If $y = |x|$ for $x < 0$ and $y = x$ for $x \geq 0$ then
(GATE -EC- 1997)

- (a) $\frac{dy}{dx}$ is discontinuous at $x = 0$
- (b) y is discontinuous at $x = 0$
- (c) y is not defined at $x = 0$
- (d) Both y and $\frac{dy}{dx}$ are discontinuous at $x = 0$

10. The value of

$$\lim_{x \rightarrow 1} \frac{x^3 - 3x + 2}{x^3 - x^2 - x + 1}$$

Is _____ [round off to one decimal place]

(GATE-2022-PI)

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$$11. \lim_{x \rightarrow 0} \frac{1}{10} \frac{1 - e^{-j5x}}{1 - e^{-jx}} = \underline{\hspace{2cm}}$$

(GATE -IN-1998)

- (a) 0
- (b) 1.1
- (c) 0.5
- (d) 1

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12. Limit of the function, $\lim_{n \rightarrow \infty} \frac{n}{\sqrt{n^2 + n}}$ is _____ (GATE -EC-1999)

- (a) $\frac{1}{2}$
- (b) 0
- (c) ∞
- (d) 1

13. Value of the function $\lim_{x \rightarrow a} (x-a)^{x-a}$ is _____ (GATE -CS-1999)

- (a) 1
- (b) 0
- (c) ∞
- (d) a

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14. The function $f(x) = e^x$ is _____ (GATE -EC-1999)

- (a) Even
- (b) Odd
- (c) Neither even nor odd
- (d) None

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15. Consider the following integral $\lim_{a \rightarrow \infty} \int_1^a x^{-4} dx$

(GATE -CS-2000)

- (a) diverges
- (b) converges to $1/3$
- (c) converges to $-1/a^3$
- (d) converges to 0

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16. Limit of the function $f(x) = \frac{1-a^4}{x^4}$ as $x \rightarrow \infty$ is given by

(GATE -CS-2000)

- (a) 1
- (b) e^{-a^4}
- (c) ∞
- (d) 0

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$$17. \lim_{x \rightarrow \frac{\pi}{4}} \frac{\sin 2\left(x - \frac{\pi}{4}\right)}{x - \frac{\pi}{4}} = \underline{\hspace{2cm}}$$

(GATE-IN-2001)

- (a) 0
- (b) $\frac{1}{2}$
- (c) 1
- (d) 2

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18. Limit of the following sequence as $n \rightarrow \infty$ is _____ $x_n = n^{\frac{1}{n}}$

(GATE -CE-2002)

- (a) 0
- (b) 1
- (c) ∞
- (d) $-\infty$

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19.Which of the following functions is not differentiable in the domain [-1, 1]?

(a) $f(x) = x^2$

(b) $f(x) = x - 1$

(c) $f(x) = 2$

(d) $f(x) = \max(1-x, x)$ **(GATE -EC-2002)**

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$$20. \lim_{x \rightarrow 0} \frac{\sin^2 x}{x} = \underline{\hspace{2cm}}$$

(GATE-CS-2003)

- (a) 0
- (b) ∞
- (c) 1
- (d) -1

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21. The value of the function, $f(x) = \lim_{x \rightarrow 0} \frac{x^3 + x^2}{2x^3 - 7x^2}$ is _____ (GATE-CS-2004)

- (a) 0
- (b) $\frac{-1}{7}$
- (b) $\frac{1}{7}$
- (d) ∞

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22. Consider the function $f(x) = |x|^3$, where x is real.

Then the function $f(x)$ at $x = 0$ is

(GATE -IN-2007)

- (a) continuous but not differentiable
- (b) once differentiable but not twice
- (c) twice differentiable but not thrice
- (d) thrice differentiable

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$$23. \lim_{x \rightarrow 0} \frac{e^x - \left(1 + x + \frac{x^2}{2}\right)}{x^3} = \text{(GATE-ME-2007)}$$

(a) 0

(b) $\frac{1}{6}$

(c) $\frac{1}{3}$

(d) 1

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24. If $y = x + \sqrt{x + \sqrt{x + \sqrt{x + \dots \alpha}}}$ then $y(2) = \dots$ (GATE-ME-2007)

- (a) 4 (or) 1
- (b) 4 only
- (c) 1 only
- (d) Undefined

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25.What is the value of $\lim_{x \rightarrow \pi/4} \frac{\cos x - \sin x}{x - \pi/4}$ (GATE-PI-
2007)

- (a) $\sqrt{2}$
- (b) 0
- (c) $-\sqrt{2}$
- (d) Limit does not exist

26. $\lim_{\theta \rightarrow 0} \frac{\sin(\theta/2)}{\theta}$ is

(GATE-EC-2007)

- (a) 0.5
- (b) 1
- (c) 2
- (d) not defined

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$$27. \lim_{x \rightarrow \infty} \frac{x - \sin x}{x + \cos x} = \underline{\hspace{2cm}}$$

(GATE-EC-2008)

- (a) 1
- (b) -1
- (c) ∞
- (d) $-\infty$

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28. Given $y = x^2 + 2x + 10$ the value of $\left.\frac{dy}{dx}\right|_{x=1}$ is equal to (GATE-IN-2008)

- (a) 0
- (b) 4
- (c) 12
- (d) 13

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29. $\lim_{x \rightarrow 0} \frac{\sin x}{x}$ is

(GATE-IN-2008)

- (a) indeterminate
- (b) 0
- (c) 1
- (d) ∞

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30. The value of $\lim_{x \rightarrow 8} \frac{x^{1/3} - 2}{x - 8}$ is

(GATE-ME-2008)

(a) $\frac{1}{16}$

(b) $\frac{1}{12}$

(c) $\frac{1}{8}$

(d) $\frac{1}{4}$

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31. The value of the expression $\lim_{x \rightarrow 0} \left[\frac{\sin(x)}{e^x - x} \right]$ is **(GATE-PI-2008)**

- (a) 0
- (b) $\frac{1}{2}$
- (c) 1
- (d) $\frac{1}{1+e}$

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32. The total derivative of the function 'xy' is **(GATE-PI-2009)**

- (a) $x \, dy + y \, dx$
- (b) $x \, dx + y \, dy$
- (c) $dx + dy$
- (d) $dx \, dy$

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33. If $f(x) = \sin |x|$ then the value of $\frac{df}{dx}$ at $x = -\frac{\pi}{4}$ is **(GATE-PI-2010)**

- (a) 0
- (b) $\frac{1}{\sqrt{2}}$
- (c) $-\frac{1}{\sqrt{2}}$
- (d) 1

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34. What is the value of $\lim_{n \rightarrow \infty} \left(1 - \frac{1}{n}\right)^{2n}$?

(GATE-CS-2010)

- (a) 0
- (b) e^{-2}
- (c) $e^{-t/2}$
- (d) 1

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35. The $\lim_{x \rightarrow 0} \frac{\sin\left(\frac{2}{3}x\right)}{x}$ is (GATE-CE-2010)

- (a) $\frac{2}{3}$
- (b) 1
- (c) $\frac{3}{2}$
- (d) ∞

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36. The function $y = |2-3x|$

(GATE-ME-2010)

- (a) is continuous $\forall x \in R$ and differentiable $\forall x \in R$
- (b) is continuous $\forall x \in R$ and differentiable $\forall x \in R$ except at $x = \frac{3}{2}$
- (c) is continuous $\forall x \in R$ and differentiable $\forall x \in R$ except at $x = \frac{2}{3}$
- (d) is continuous $\forall x \in R$ and except at $x = 3$ and differentiable $\forall x \in R$

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37.What should be the value of λ such that the function defined below is continuous at $x = \frac{\pi}{2}$? (GATE-CE-2011)

$$f(x) = \begin{cases} \frac{\lambda \cos x}{\frac{\pi}{2} - x}, & \text{if } x \neq \frac{\pi}{2} \\ 1, & \text{if } x = \frac{\pi}{2} \end{cases}$$

- (a) 0
- (b) 2π
- (c) 1
- (d) $\frac{\pi}{2}$

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38.What is $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta}$ equal to ? (GATE-ME-2011)

- (a) θ
- (b) $\sin \theta$
- (c) 0
- (d) 1

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39. Consider the function $f(x) = |x|$ in the interval $-1 \leq x \leq 1$. At the point $x = 0$, $f(x)$ is (GATE-ME,PI-2012)

- (a) continuous and differentiable
- (b) non-continuous and differentiable
- (c) continuous and non-differentiable
- (d) neither continuous nor differentiable

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40. $\lim_{x \rightarrow 0} \left(\frac{1 - \cos x}{x^2} \right)$ is

(GATE-ME,PI-2012)

- (a) 1/4
- (b) 1/2
- (c) 1
- (d) 2

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41. A function $y = 5x^2 + 10x$ is defined over an open interval $x = (1, 2)$. At least at one point in this interval, $\frac{dy}{dx}$ is exactly (GATE-EE-2013)

(a) 20

(b) 25

(c) 30

(d) 35

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42. Which one of the following functions is continuous at $x = 3$?

(GATE-CS-2013)

$$(a) f(x) = \begin{cases} 2, & \text{if } x = 3 \\ x - 1 & \text{if } x > 3 \\ \frac{x+3}{3}, & \text{if } x < 3 \end{cases}$$

$$(c) f(x) = \begin{cases} x + 3, & \text{if } x \leq 3 \\ x - 4 & \text{if } x > 3 \end{cases}$$

$$(b) f(x) = \begin{cases} 4, & \text{if } x = 3 \\ 8 - x & \text{if } x \neq 3 \end{cases}$$

$$(d) f(x) = \frac{1}{x^3 - 27}, \text{ if } x \neq 3$$

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43. The value of $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x$ is

(GATE-EC-SET-2-2014)

- (a) $\ln 2$
- (b) 1.0
- (c) e
- (d) ∞

$$44. \lim_{x \rightarrow 0} \frac{x - \sin x}{1 - \cos x}$$

(GATE-ME-SET-1-2014)

- (a) 0
- (b) 1
- (c) 3
- (d) not defined

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45. $\lim_{x \rightarrow 0} \left(\frac{e^{2x} - 1}{\sin(4x)} \right)$ is equal to

(GATE-ME-SET-2-2014)

- (a) 0
- (b) 0.5
- (c) 1
- (d) 2

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46. If a function is continuous at a point,

(GATE-ME-SET-3-2014)

- (a) the limit of the function may not exist at the point
- (b) the function must be derivable at the point
- (c) the limit of the function at the point tends to infinity
- (d) the limit must exist at the point and the value of limit should be same as the value of the function at the point.

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47. $\lim_{x \rightarrow \infty} \left(\frac{x + \sin x}{x} \right)$ equal to

(GATE-CE-SET-1-2014)

- (a) $-\infty$
- (b) 0
- (c) 1
- (d) ∞

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48. The expression $\lim_{a \rightarrow 0} \frac{x^a - 1}{a}$ is equal to (GATE-CE-SET-2-2014)

- (a) $\log x$
- (b) 0
- (c) $x \log x$
- (d) ∞

49. The function $f(x) = x \sin x$ satisfies the following equation:

$f''(x) + f(x) + t \cos x = 0$. The value of t is _____.

(GATE-CS-SET-1-2014)

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50. The value of $\lim_{x \rightarrow \infty} \frac{\sqrt{9x^2 + 2020}}{x + 7}$ is

GATE-2021 (CE)

- (a) 1
- (b) 3
- (c) $\frac{7}{9}$
- (d) Indeterminable

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51. $\lim_{x \rightarrow \infty} x^{1/x}$ is

(GATE-CS-2015)

- (a) ∞
- (b) 0
- (c) 1
- (d) Not defined

52. The limit $p = \lim_{x \rightarrow \pi} \left(\frac{x^2 + \alpha x + 2\pi^2}{x - \pi + 2\sin x} \right)$

has a finite value of real α . The value of α and the corresponding limit p are

(GATE-2022-ME)

- (a) $\alpha = -3\pi$, and $p = \pi$
- (b) $\alpha = -2\pi$, and $p = 2\pi$
- (c) $\alpha = \pi$, and $p = \pi$
- (d) $\alpha = 2\pi$, and $p = 3\pi$

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53. The value of $\lim_{x \rightarrow \infty} (1 + x^2)^{e^{-x}}$ is

(GATE-CS-2015)

- (a) 0
- (b) $\frac{1}{2}$
- (c) 1
- (d) ∞

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54. $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^{2x}$ is equal to (GATE-CE-2015)
- (a) e^{-2} (b) e (c) 1 (d) e^2

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55. The value of $\lim_{x \rightarrow \infty} \frac{1 - \cos(x^2)}{2x^4}$ is

(GATE-ME-2015)

- (a) 0
- (b) $\frac{1}{2}$
- (c) $\frac{1}{4}$
- (d) undefined

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56. At $x = 0$, the function $f(x) = |x|$ has

(GATE-ME-2015)

- (a) A minimum
- (b) A maximum
- (c) A point of inflection
- (d) neither a maximum nor minimum

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57. The value of $\lim_{x \rightarrow 0} \left(\frac{-\sin x}{2 \sin x - x \cos x} \right)$ is _____

(GATE-ME-2015)

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58. The value of $\lim_{x \rightarrow \infty} \frac{x^2 - 5x + 4}{4x^2 + 2x}$ is

GATE-2020 (CE)

(a) 0

(b) 1

(c) $\frac{1}{4}$

(d) $\frac{1}{2}$

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59. Consider the limit:

GATE-2021 (CE)

$$\lim_{x \rightarrow 1} \left(\frac{1}{\ln x} - \frac{1}{x-1} \right)$$

The limit (correct up to one decimal place) is _____

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60. The value of $\lim_{x \rightarrow \infty} \frac{x \ln(x)}{1 + x^2}$ is

GATE-20201(CE)

- (a) 1.0
- (b) 0.5
- (c) ∞
- (d) 0

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61. The function $f(x,y) = x^2y - 3xy + 2y + x$ has
 (GATE-ME-1994)

- (a) No local extreme
- (b) One local maximum but no local minimum
- (c) One local minimum but no local maximum
- (d) One local minimum and one local maximum

$$f(x,y) = x^2y - 3xy + 2y + x.$$

$f(x,y)$	$\frac{\partial f}{\partial x} = 0$
$p = \frac{\partial f}{\partial x}$	$\frac{\partial f}{\partial y} = 0$
$q = \frac{\partial f}{\partial y}$	$() ()$
$r = \frac{\partial^2 f}{\partial x^2}$	$\gamma t - s^2 > 0 \text{ and } \gamma < 0$
$s = \frac{\partial^2 f}{\partial x \partial y}$	maximum
$t = \frac{\partial^2 f}{\partial y^2}$	$\gamma t - s^2 > 0 \text{ and } \gamma > 0$ minimum.
	$\gamma t - s^2 < 0$ Neither Max nor min. saddle point

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$$f(x, y) = x^2y - 3xy + 2y + x.$$

$$P = \frac{\partial f}{\partial x} = 2xy - 3y + 1$$

$$Q = \frac{\partial f}{\partial y} = x^2 - 3x + 2$$

$$\gamma = \frac{\partial^2 f}{\partial x^2} = 2y$$

$$S = \frac{\partial^2 f}{\partial x \partial y} = 2x - 3.$$

$$t = \frac{\partial^2 f}{\partial y^2} = 0$$

$$\gamma t - S^2 = 0 - (2x-3)^2 < 0$$

Neither Max nor minimum

62. The function $y = x^2 + \frac{250}{x}$ at $x = 5$ attains

(GATE-EC-1994)

(a) Maximum

~~(b) Minimum~~

(c) Neither

(d) 1

$$y' = 2x - \frac{250}{x^2}$$

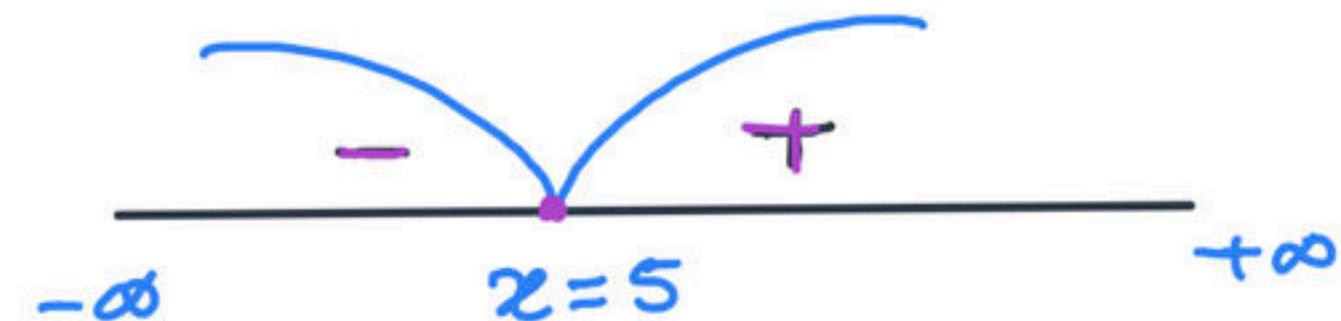
$$y' = \frac{2x^3 - 250}{x^2}$$

$$y' = \frac{2(x^3 - 125)}{x^2}$$

|

$$x = 5$$

minimum



| if y' sign changes from +ve to -ve
then maximum

| if y' sign changes from -ve to +ve then
minimum.

Jumping Japag

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63. The function $f(x) = x^3 - 6x^2 + 9x + 25$ has

(GATE-EE-1995)

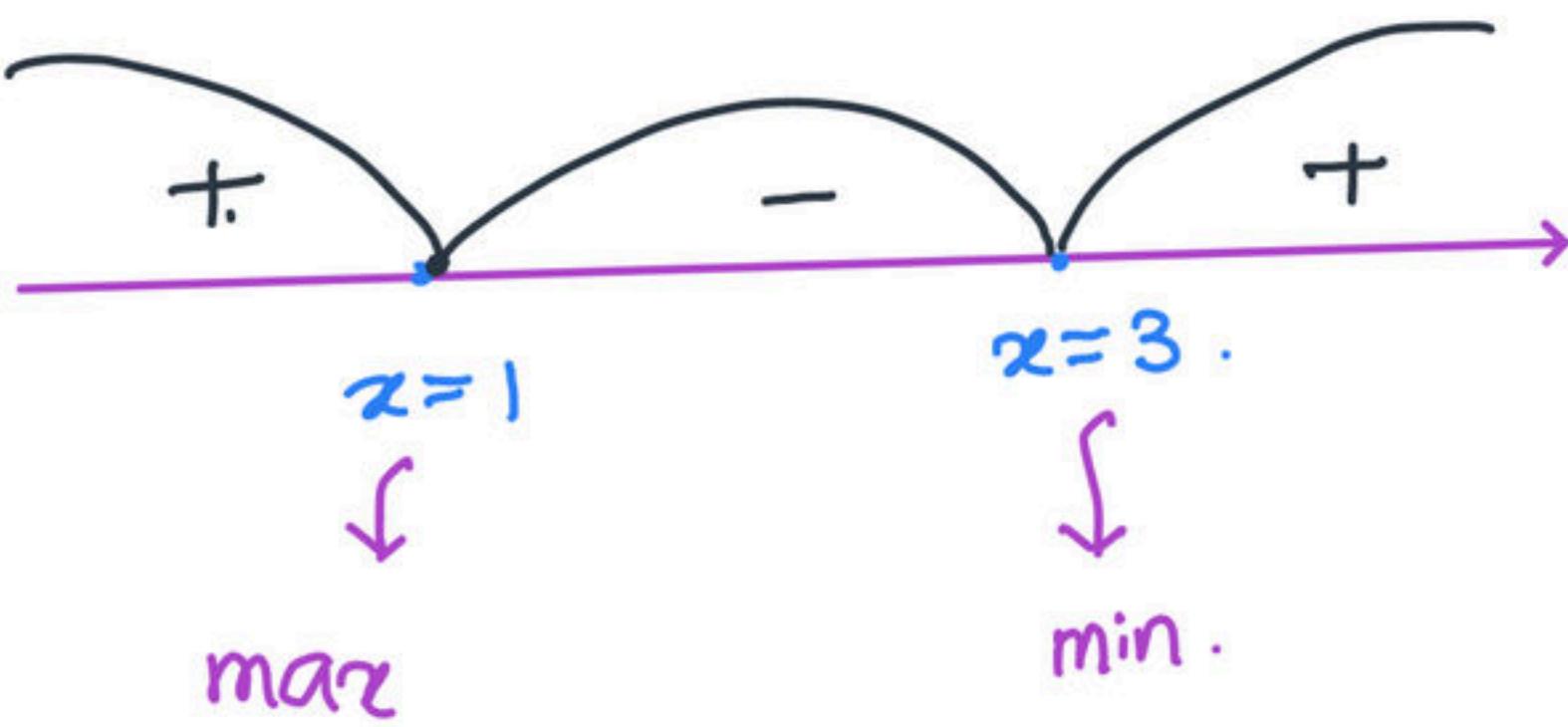
- (a) a maxima at $x = 1$ and a minima at $x = 3$
- (b) a maxima at $x = 3$ and a minima at $x = 1$
- (c) no maxima, but a minima at $x = 3$
- (d) a maxima at $x = 1$, but no minima

$$f'(x) = 3x^2 - 12x + 9 = 0$$

$$x^2 - 4x + 3 = 0$$

$$(x-3)(x-1) = 0$$

$$x = 1, 3$$



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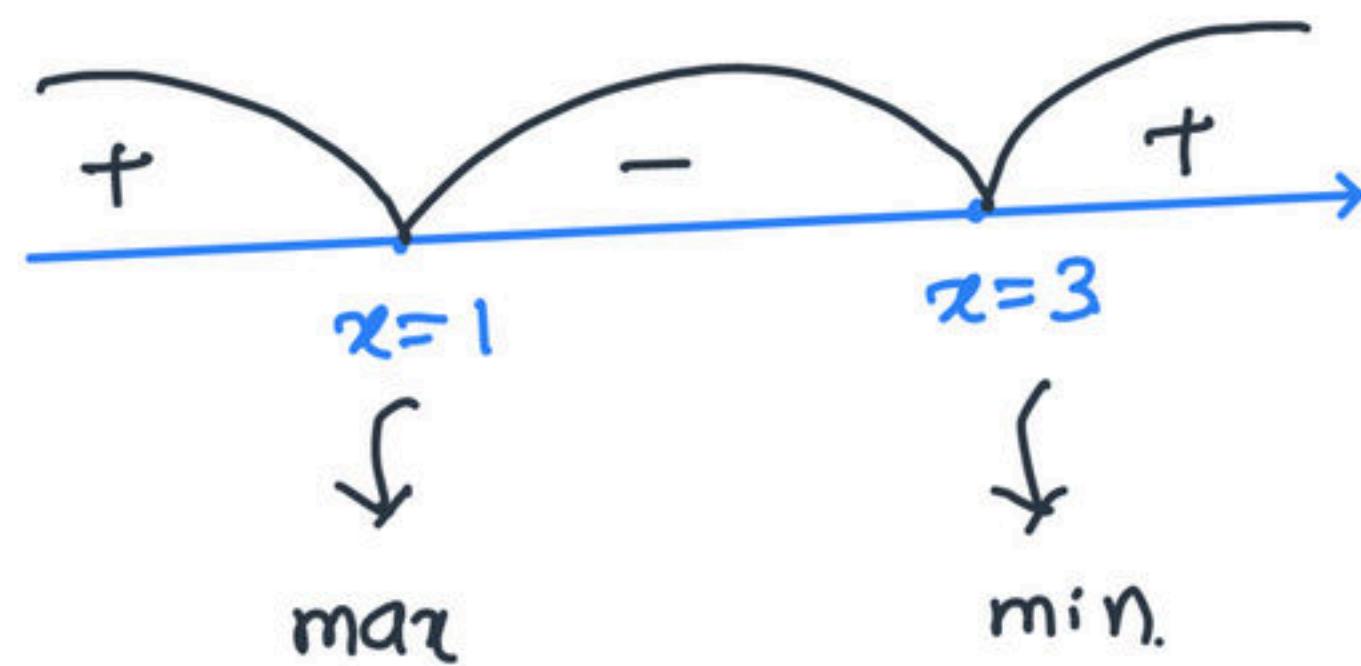
64. Find the points of local maxima and minima if any of the following function defined in $0 \leq x \leq 6$, $f(x) = x^3 - 6x^2 + 9x + 15$.
(GATE-CS-1998)

$$f'(x) = 3x^2 - 12x + 9 = 0$$

$$x^2 - 4x + 3 = 0$$

$$(x-1)(x-3) = 0$$

$$x=1, \quad x=3.$$



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65. The continuous function $f(x,y)$ is said to have saddle point at (a, b) if

(a) $f_x(a, b) = f_y(a, b) = 0, f_{xy}^2 - f_{xx}f_{yy} < 0$ at (a, b)

$\gamma t - s^2 < 0$

(GATE-EE-1998)

~~(b) $f_x(a, b) = 0, f_y(a, b) = 0, f_{xy}^2 - f_{xx}f_{yy} > 0$ at (a, b)~~

$P = \frac{\partial f}{\partial x} = f_x = 0$

(c) $f_x(a, b) = 0, f_y(a, b) = 0, f_{xx}$ and $f_{yy} < 0$ at (a, b)

$q = \frac{\partial f}{\partial y} = f_y = 0$

(d) $f_x(a, b) = 0, f_y(a, b) = 0, f_{xy}^2 - f_{xx}f_{yy} = 0$ at (a, b)

(a b)

$$\gamma = \frac{\partial^2 f}{\partial x^2} = f_{xx}$$

$$f_{xx} f_{yy} - f_{xy}^2 < 0$$

$$S = \frac{\partial^2 f}{\partial x \partial y} = f_{xy}$$

$$f_{xy}^2 > f_{xx} f_{yy}$$

$$t = \frac{\partial^2 f}{\partial y^2} = f_{yy}$$

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66. Number of inflection points for the curve $y = x + 2x^4$ is _____
(GATE-CE-1999)

(a) 3

(b) 1

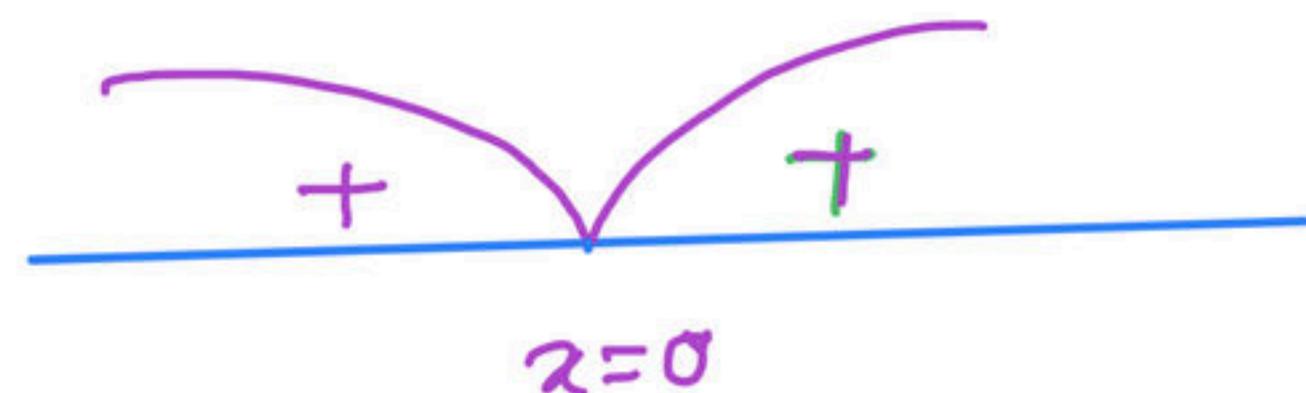
(c) 0

(d) 2

$$y' = 1 + 8x^3$$

$$y'' = 0 + 24x^2.$$

$$x = 0$$



No points of inflection.

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67. If $f(x, y, z) = (x^2 + y^2 + z^2)^{-1/2}$, $\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} + \frac{\partial^2 f}{\partial z^2}$ is equal to _____

(GATE-EC-2000)

(a) 0

(b) 1

(c) 2

(d) $-3(x^2 + y^2 + z^2)^{-5/2}$

$$f = \frac{1}{\sqrt{x^2 + y^2 + z^2}}$$

$$\begin{aligned}\frac{\partial f}{\partial x} &= -\frac{1}{2}(x^2 + y^2 + z^2)^{-\frac{3}{2}} (\cancel{\partial x}) = -x(x^2 + y^2 + z^2)^{-\frac{3}{2}} \\ \frac{\partial^2 f}{\partial x^2} &= +x \cancel{\frac{3}{2}}(x^2 + y^2 + z^2)^{-\frac{5}{2}} (\cancel{\partial x}) - (x^2 + y^2 + z^2)^{-\frac{3}{2}} \\ &= 3x^2(x^2 + y^2 + z^2)^{-\frac{5}{2}} - (x^2 + y^2 + z^2)^{-\frac{3}{2}}.\end{aligned}$$

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$$\frac{\partial^2 f}{\partial x^2} = 3x^2(x^2 + y^2 + z^2)^{-\frac{5}{2}} - (x^2 + y^2 + z^2)^{-\frac{3}{2}}$$

$$\frac{\partial^2 f}{\partial y^2} = 3y^2(x^2 + y^2 + z^2)^{-\frac{5}{2}} - (x^2 + y^2 + z^2)^{-\frac{3}{2}}.$$

$$\frac{\partial^2 f}{\partial z^2} = 3z^2(x^2 + y^2 + z^2)^{-\frac{5}{2}} - (x^2 + y^2 + z^2)^{-\frac{3}{2}}.$$

$$\begin{aligned}\frac{\partial^2 f}{\partial x^2} + \frac{\partial^2 f}{\partial y^2} + \frac{\partial^2 f}{\partial z^2} &= 3(x^2 + y^2 + z^2)^{-\frac{5}{2}}(x^2 + y^2 + z^2)^{\frac{1}{2}} - 3(x^2 + y^2 + z^2)^{-\frac{3}{2}} \\ &= 0\end{aligned}$$

68. The following function has local minima at which value of x,

$$f(x) = x\sqrt{5-x^2}$$

(a) $\frac{-\sqrt{5}}{2}$

(b) $\sqrt{5}$

(c) $\sqrt{\frac{5}{2}}$

(d) ~~$-\sqrt{\frac{5}{2}}$~~

$$f'(x) = x \cancel{\frac{1}{2}} (5-x^2)^{\frac{1}{2}} (-2x) + \sqrt{5-x^2} \quad (1)$$

$$\cdot x^2 (5-x^2)^{\frac{1}{2}} = \sqrt{5-x^2}$$

$$x^2 = 5-x^2 \quad \left| \begin{array}{l} x = \pm \sqrt{\frac{5}{2}} \\ x = +\sqrt{\frac{5}{2}} \end{array} \right.$$

$$2x^2 = 5$$

$$x = -\sqrt{\frac{5}{2}}$$

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$$f'(x) = \frac{-x^2}{\sqrt{5-x^2}} + \sqrt{5-x^2}.$$

$$f'(x) = -x^2(5-x^2)^{-\frac{1}{2}} + (5-x^2)^{\frac{1}{2}}.$$

$$f''(x) = +x^2 \cancel{\frac{1}{2}} (5-x^2)^{-\frac{3}{2}} (-2x) - (5-x^2)^{\frac{1}{2}} (2x) + \cancel{\frac{1}{2}} (5-x^2)^{-\frac{1}{2}} (-2x)$$

$$f''(x) = -x^3(5-x^2)^{-\frac{3}{2}} - 2x(5-x^2)^{-\frac{1}{2}} - x(5-x^2)^{-\frac{1}{2}}$$

$$x = \sqrt{\frac{5}{2}}$$

$$f''\left(\sqrt{\frac{5}{2}}\right) < 0 \rightarrow \text{max.}$$

$$x = -\sqrt{\frac{5}{2}}$$

$$f''\left(-\sqrt{\frac{5}{2}}\right) > 0 \rightarrow \text{min.}$$

69. The function $f(x,y) = 2x^2 + 2xy - y^3$ has

(GATE-EC-2000)

- (a) Only one stationary point at (0, 0)
- (b) Two stationary points at (0, 0) and (1/6, -1/3)
- (c) Two stationary points at (0, 0) and (1, -1)
- (d) No stationary point

$$4x + 2y = 0$$

$$2x - 3y^2 = 0$$

$$(0,0) \quad \left(\frac{1}{6}, -\frac{1}{3}\right)$$

$$P = \frac{\partial f}{\partial x} = 4x + 2y$$

$$Q = \frac{\partial f}{\partial y} = 2x - 3y^2.$$

$$R = \frac{\partial^2 f}{\partial x^2} = 4 \quad \left| \begin{array}{l} \\ t = \frac{\partial^2 f}{\partial y^2} = -6y. \end{array} \right.$$

$$S = \frac{\partial^2 f}{\partial x \partial y} = 2$$

Use the code: BVREDDY , to get maximum benefits

70. The function $f(x) = 2x^3 - 3x^2 - 36x + 2$ has its maxima at

(GATE-CS-2004)

- ~~(a) $x = -2$ only~~
(c) $x = 3$ only

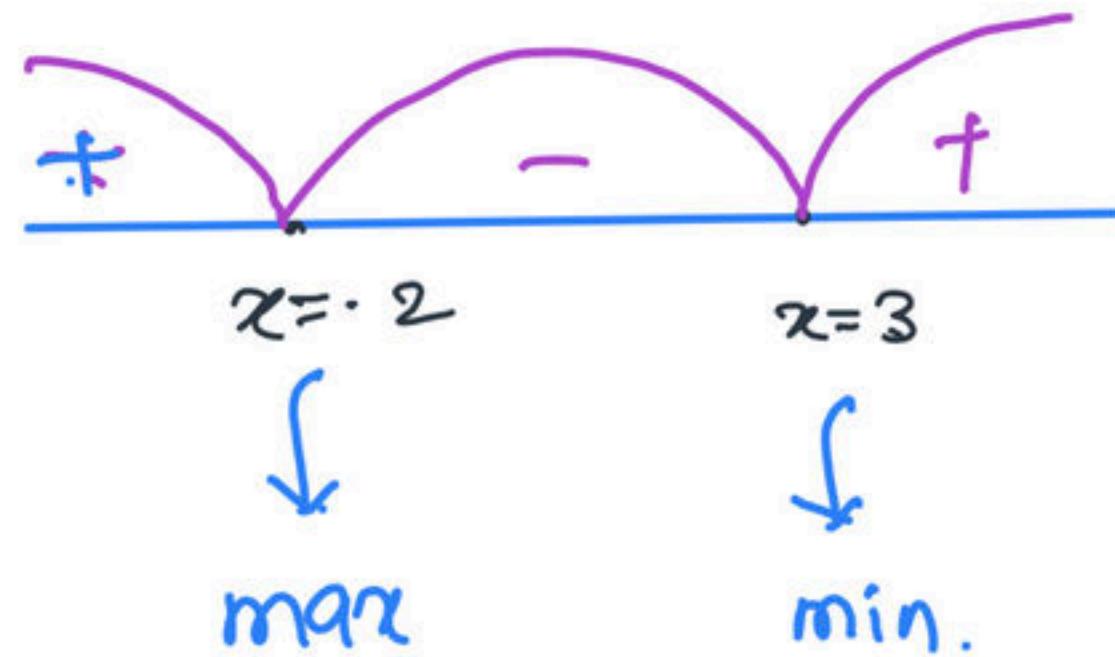
- (b) $x = 0$ only
(d) both $x = -2$ and $x = 3$

$$f'(x) = 6x^2 - 6x - 36 = 0$$

$$x^2 - x - 6 = 0$$

$$x = 3, \quad x = -2.$$

$$(x+2)(x-3) = 0$$



Use the code: **BVREDDY**, to get maximum benefits

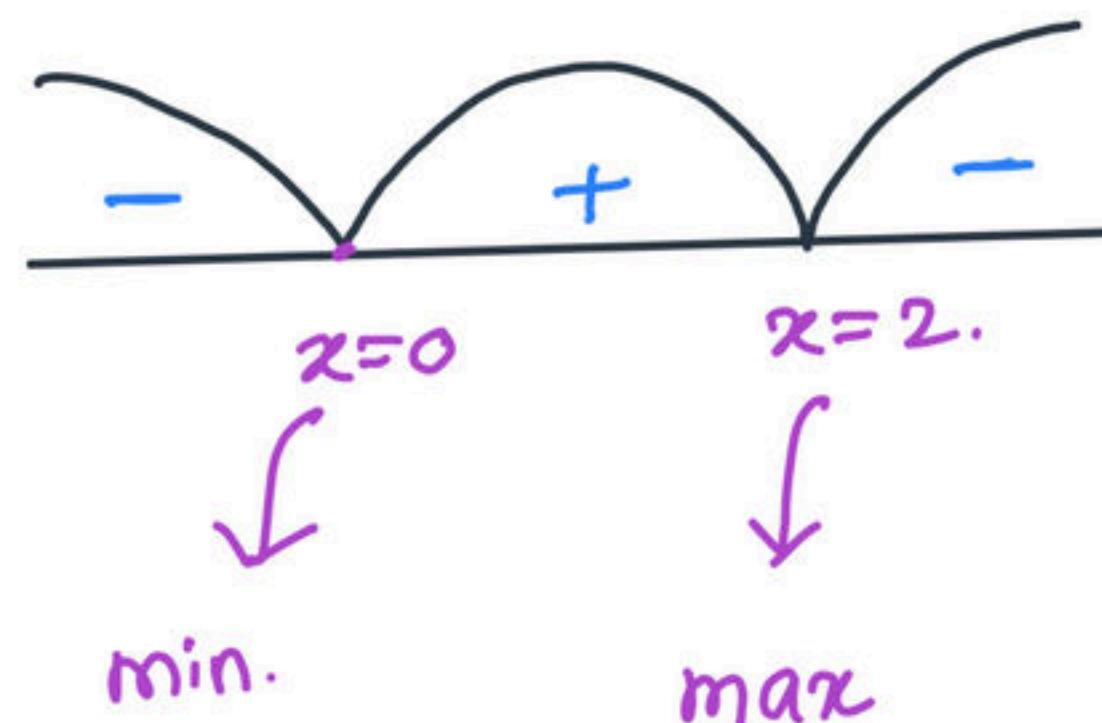
71. For the function $f(x) = x^2 e^{-x}$, the maximum occurs when x is equal to
- (a) 2 (b) 1 (c) 0 (d) -1

$$f'(x) = -x^2 e^{-x} + e^{-x} \cdot 2x$$

$$f'(x) = -e^{-x}(x^2 - 2x)$$

$$f'(x) = -e^{-x} x(x-2)$$

$$x=0, \quad x=2.$$



Use the code: BVREDDY , to get maximum benefits

72. For real x , the maximum value of $\frac{e^{\sin x}}{e^{\cos x}}$ is

(GATE-IN-2007)

(a) 1

(b) e

~~(c) $e^{\sqrt{2}}$~~

(d) ∞

$$f(x) = e^{\sin x - \cos x}$$

$$\text{at } x = \frac{3\pi}{4}$$

$$\sin x = \frac{1}{\sqrt{2}}$$

$$\cos x = \frac{-1}{\sqrt{2}}$$

$$= e^{\sqrt{2}}$$

$$\text{at } x = 135^\circ$$

$$\sin x + \cos x$$

$$\left. \begin{array}{l} \text{at } x=0 \\ \sin x=0 \\ \cos x=1 \end{array} \right|$$

$$\text{at } x=45^\circ$$

$$\sin x = \frac{1}{\sqrt{2}}$$

$$\cos x = \frac{1}{\sqrt{2}}$$

$$\left. \begin{array}{l} \text{at } x=90^\circ \\ \sin x=1 \\ \cos x=0 \end{array} \right|$$

$$\frac{2}{\sqrt{2}} = \sqrt{2}$$

Use the code: **BVREDDY**, to get maximum benefits

$$\sin x - \cos x.$$

$$f(x) = e$$

$$\sin x - \cos x$$

$$f'(x) = e \left(\cos x + \sin x \right) = 0.$$

$$\cos x + \sin x = 0.$$

$$\sin x = -\cos x.$$

$$\frac{\sin x}{\cos x} = -1$$

$$\tan x = -1$$

$$x = \frac{3\pi}{4}$$

$$f(x) \Big|_{x=\frac{3\pi}{4}} = e^{\sqrt{2}}$$

73. The minimum value of function $y = x^2$ in the interval $[1, 5]$ is

(GATE-ME-2007)

(a) 0

(b) 1

(c) 25

(d) undefined

$$y = x^2$$

$$y' = 2x$$

$$\textcircled{x=0}$$

$$y(\underline{x=0}) = 0$$

$$y(\underline{x=1}) = 1$$

$$y(\underline{x=5}) = 25$$

Use the code: BVREDDY , to get maximum benefits

74. For the function $f(x,y) = x^2 - y^2$ defined on \mathbb{R}^2 , the point $(0, 0)$ is (GATE-PI-2007)

- (a) a local minimum
- (b) Neither a local minimum (nor) a local maximum
- (c) a local maximum
- (d) Both a local minimum and a local maximum

Saddle point.

Neither maximum
nor minimum

$$P = \frac{\partial f}{\partial x} = 2x$$

$$t = \frac{\partial^2 f}{\partial y^2} = -2$$

$$q = \frac{\partial f}{\partial y} = -2y$$

$$\gamma t - S^2 = -4 < 0$$

$$\gamma = \frac{\partial^2 f}{\partial x^2} = 2$$

$$S = \frac{\partial^2 f}{\partial x \partial y} = 0$$

Use the code: BVREDDY , to get maximum benefits

75. Consider the function $f(x) = x^2 - x - 2$. The maximum value of $f(x)$ in the closed interval $[-4, 4]$ is

(GATE-EC-2007)

~~(a) 18~~

(b) 10

(c) -2.25

(d) indeterminate

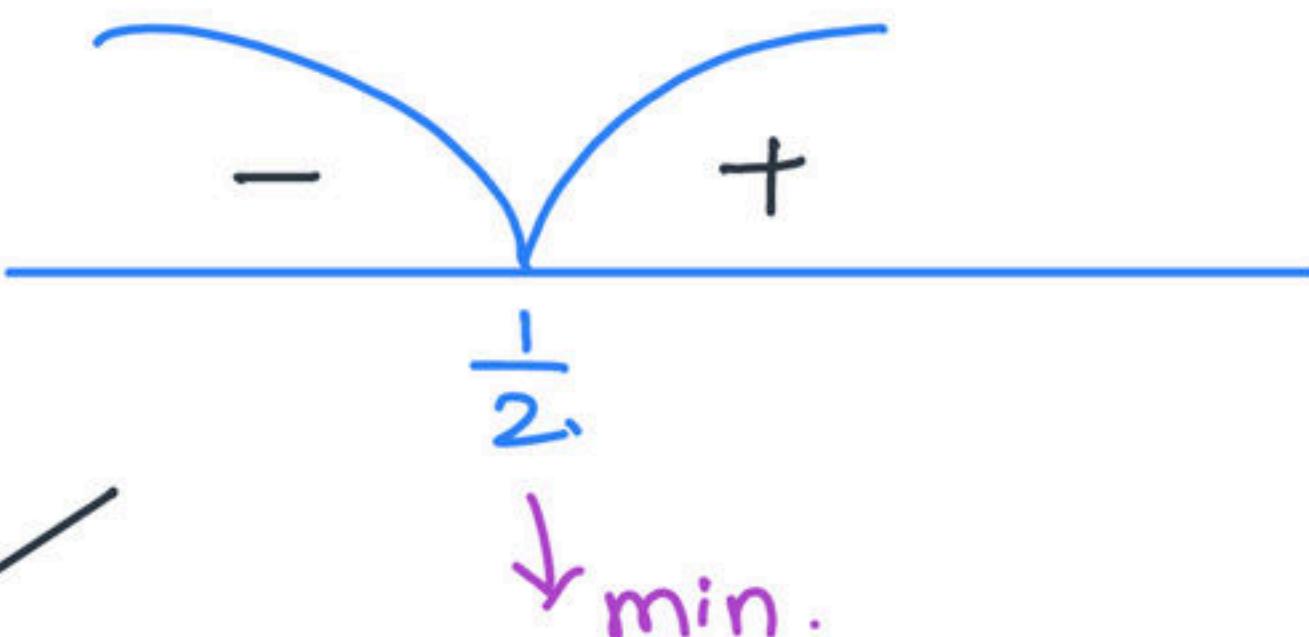
$$f'(x) = 2x - 1$$

$$= 2\left(x - \frac{1}{2}\right)$$

$$x = \frac{1}{2}.$$

$$f(-4) = 16 + 4 - 2 = 18 \checkmark$$

$$f(4) = 16 - 4 - 2 = 10$$



Use the code: BVREDDY, to get maximum benefits

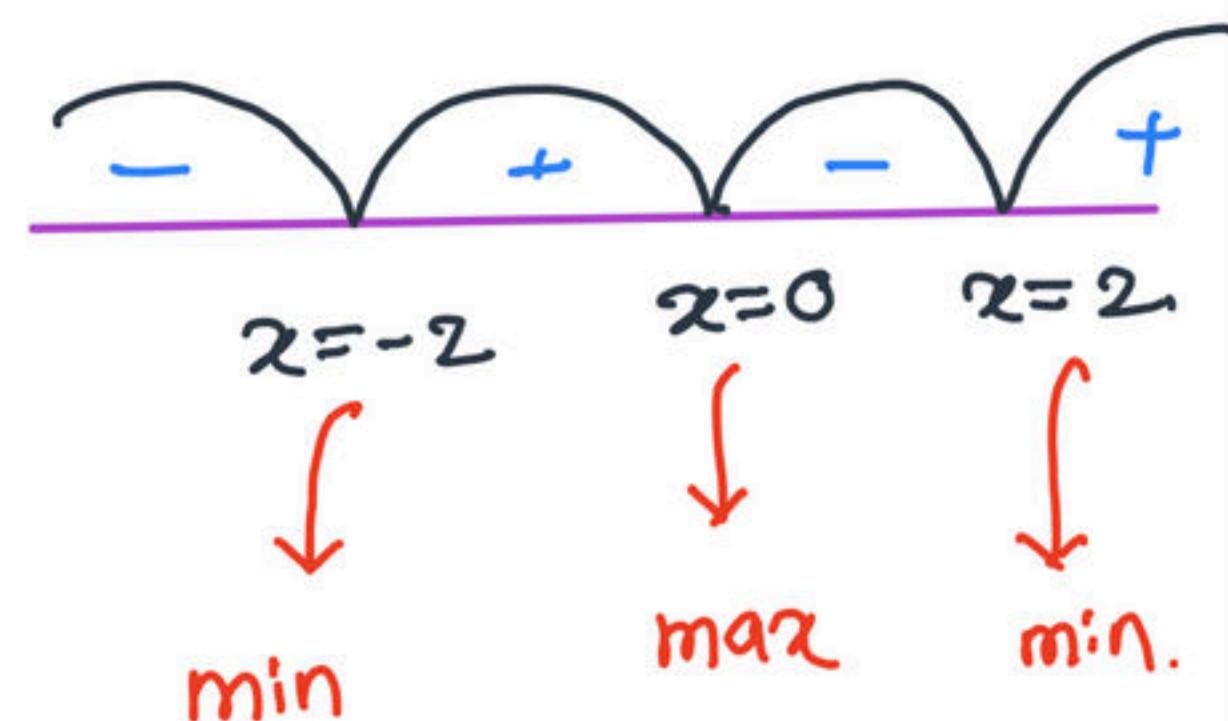
76. Consider the function $f(x) = (x^2 - 4)^2$ where x is a real number. Then the function has
(GATE-EE-2007)

- (a) Only one minimum
- ~~(b) Only two minima~~
- (c) Three minima
- (d) Three maxima

$$f'(x) = 2(x^2 - 4)(2x)$$

$$f'(x) = 4x(x-2)(x+2)$$

$$x=0, \quad x=-2, \quad x=2.$$



Use the code: **BVREDDY**, to get maximum benefits

77. A point on the curve is said to be an extremum if it is a local minimum (or) a local maximum. The number of distinct extrema for the curve $3x^4 - 16x^3 + 24x^2 + 37$ is _____

(a) 0

(b) 1

(c) 2

(d) 3

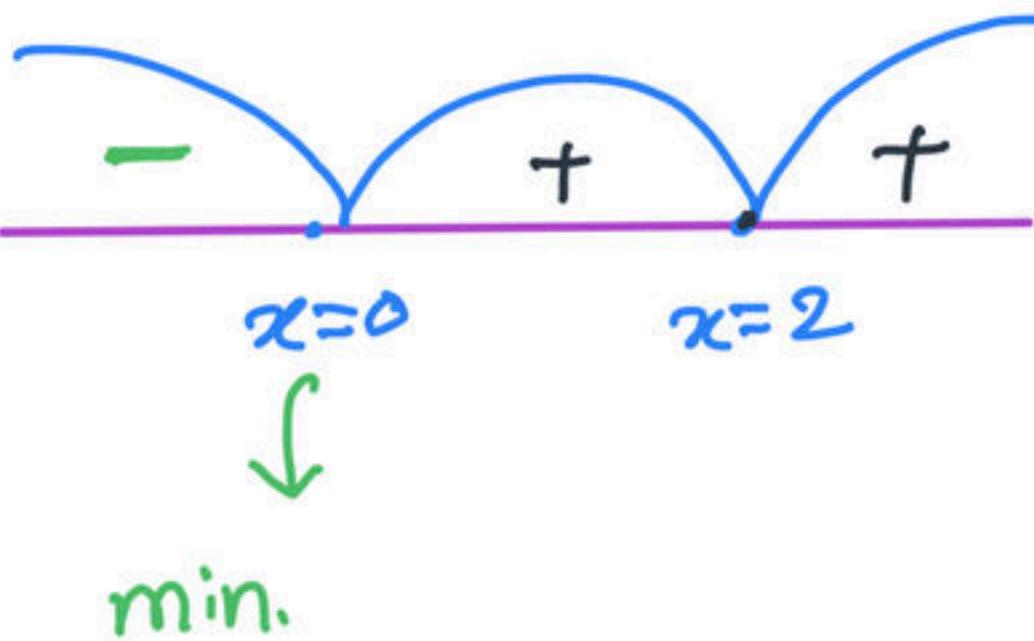
(GATE-CS-2008)

$$f'(x) = 12x^3 - 48x^2 + 48x$$

$$x^3 - 4x^2 + 4x = 0$$

$$(x-0)^1(x-2)^2$$

$$x=0, \quad x=2, 2$$



Use the code: **BVREDDY**, to get maximum benefits

78. Consider the function $y = x^2 - 6x + 9$. The maximum value of y obtained when x varies over the interval 2 to 5 is _____ (GATE-IN-2008)

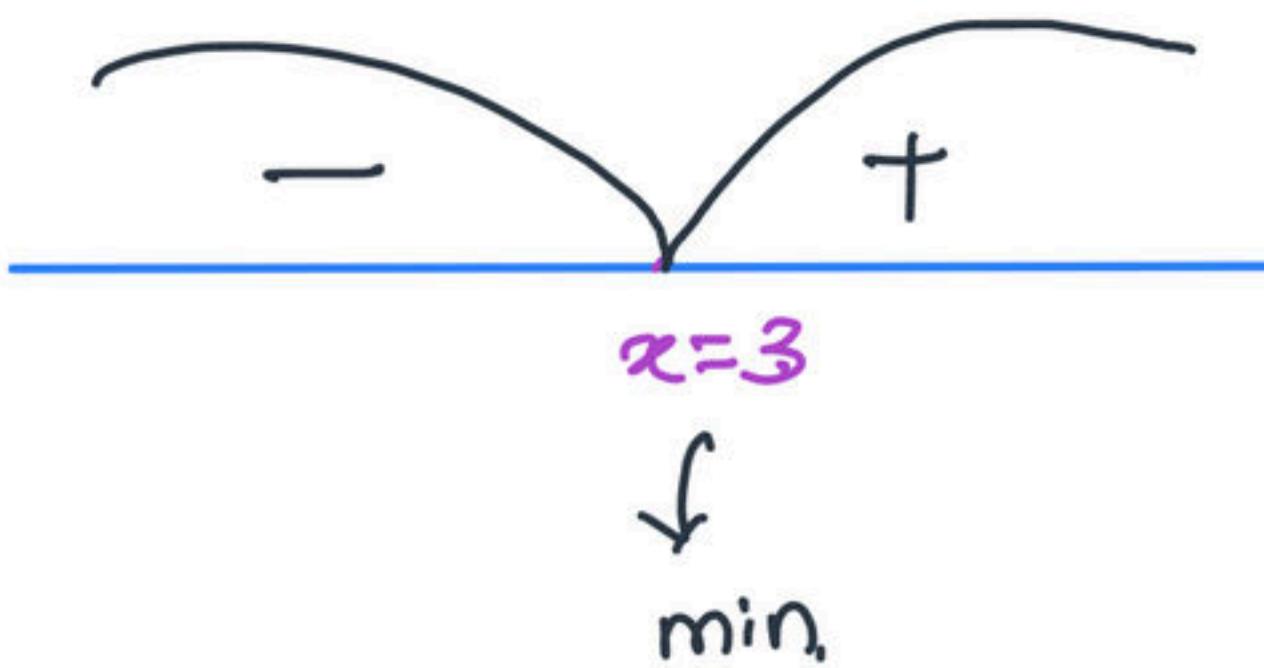
- (a) 1 (b) 3 ~~(c) 4~~ (d) 9

$$y' = 2x - 6$$

$$y = 2(x - 3)$$

$$y(2) = 4 - 12 + 9 = 1$$

$$y(5) = 25 - 30 + 9 = 4$$



Use the code: BVREDDY , to get maximum benefits

79. For real values of x , the minimum value of function

$$f(x) = e^x + e^{-x}$$

(a) 2

(b) 1

(c) 0.5

(GATE-EC-2008)

(d) 0

$$f'(x) = e^x - e^{-x} = 0$$

$$e^x = e^{-x}$$

$$e^x = \frac{1}{e^x}$$

$$e^{2x} = 1$$

$$e^{2x} = e^0$$

$$x=0$$

$$f''(x) = e^x + e^{-x} > 0$$

min.

$$f(x) \Big|_{\text{min}} = 2$$

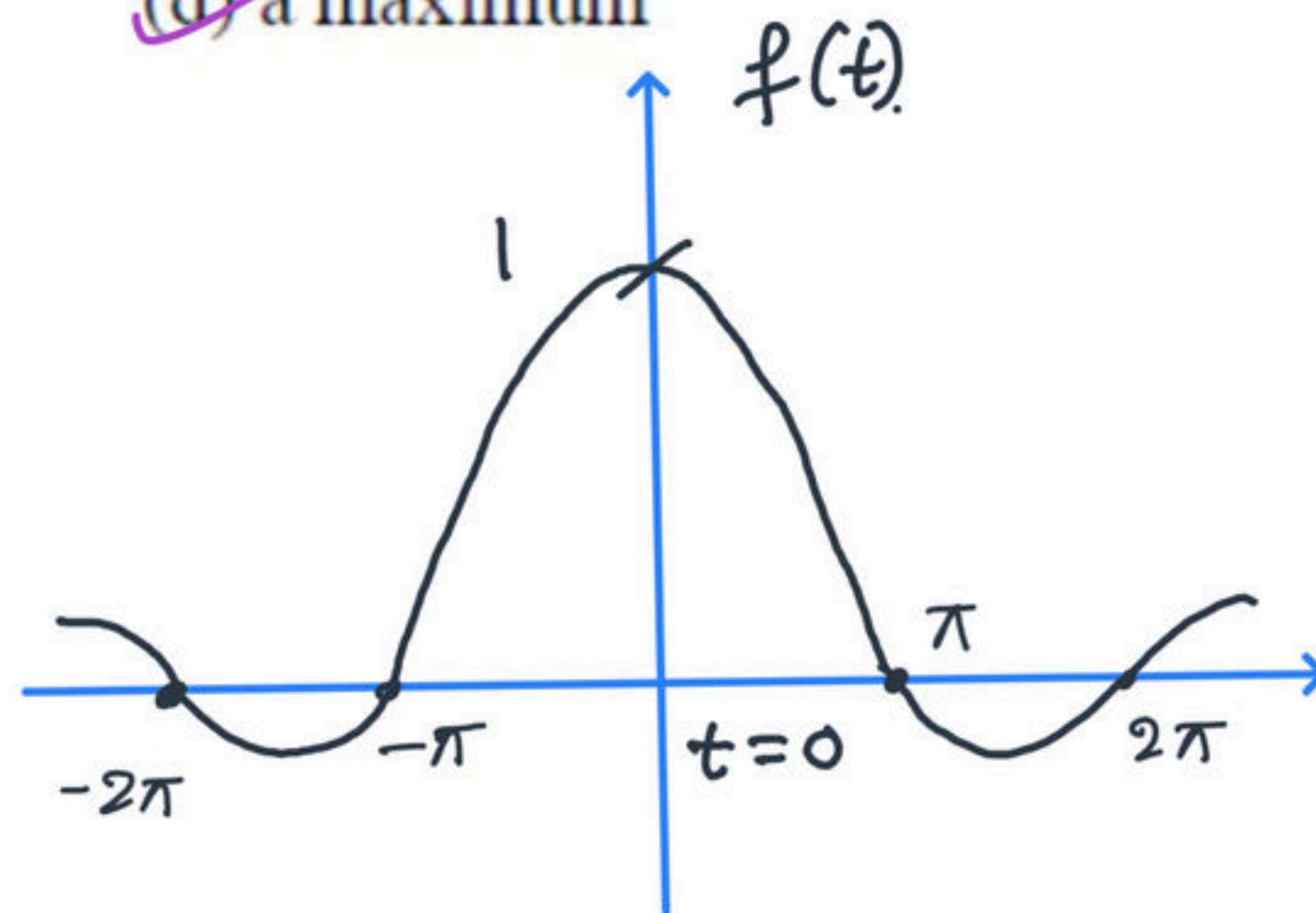
Use the code: BVREDDY , to get maximum benefits

80. At $t = 0$, the function $f(t) = \frac{\sin t}{t}$ has

(GATE-EE-2010)

- (a) a minimum
- (b) a discontinuity
- (c) a point of inflection
- (d) a maximum

$$\lim_{t \rightarrow 0} \frac{\sin t}{t} = 1.$$



Use the code: BVREDDY , to get maximum benefits

81. If $e^y = x^{1/x}$ then y has a

(GATE-EC-2010)

- (a) maximum at $x = e$
- (b) minimum at $x = e$
- (c) maximum at $x = e^{-1}$
- (d) minimum at $x = e^{-1}$

$$e^y = x^{1/x}.$$

$$y = \frac{1}{x} \log x$$

$$y' = \frac{1}{x} - \frac{1}{x^2} + \log x \left(-\frac{1}{x^2} \right)$$

$$y' = \frac{1}{x^2} (1 - \log x)$$

$$x = e$$

$$\log_e e = 1.$$

$$y'' = \frac{1}{x^2} \left[0 - \frac{1}{x} \right] + (1 - \log x) (-2/x^3)$$

$$y''(x=e) < 0$$

at $x = e$ { max

Use the code: BVREDDY, to get maximum benefits

82. Given a function $f(x,y) = 4x^2 + 6y^2 - 8x - 4y + 8$, the optimal values of $f(x, y)$ is

(GATE-CE-2010)

(a) a minimum equal to $\frac{10}{3}$

(b) a maximum equal to $\frac{10}{3}$

(c) a minimum equal to $\frac{8}{3}$

(d) a maximum equal to $\frac{8}{3}$

$$yt - s^2 = 96 > 0$$

$$x > 0$$

$$P = \frac{\partial f}{\partial x} = 8x - 8 = 0 \quad x = 1. \quad \text{minimum.}$$

$$Q = \frac{\partial f}{\partial y} = 12y - 4 = 0 \quad y = \frac{1}{3}. \quad (1, \frac{1}{3})$$

$$\gamma = \frac{\partial^2 f}{\partial x^2} = 8 \quad | \quad t = \frac{\partial^2 f}{\partial y^2} = 12. \quad f(x=1, y=\frac{1}{3}) = \frac{10}{3}$$

$$S = \frac{\partial^2 f}{\partial x \partial y} = 0$$

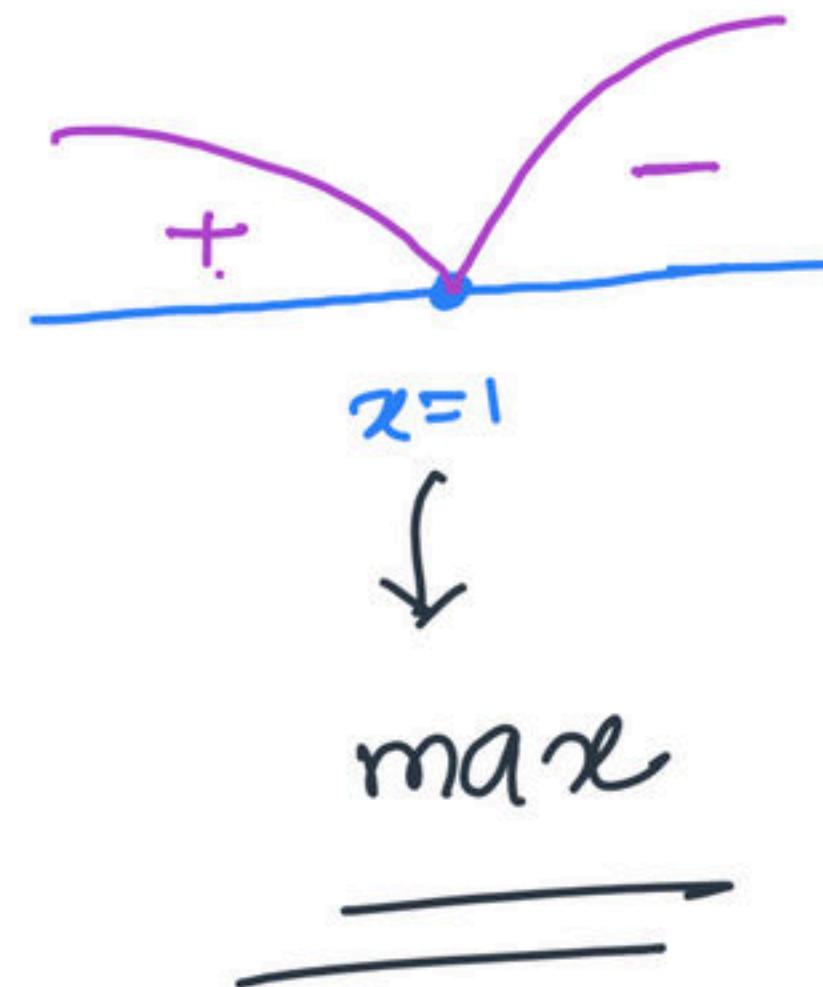
Use the code: BVREDDY , to get maximum benefits

83. The function $f(x) = 2x - x^2 + 3$ has

(GATE-EE-2011)

- (a) a maxima at $x = 1$ and a minima at $x = 5$
- (b) a maxima at $x = 1$ and a minima at $x = -5$
- ~~(c) only a maxima at $x = 1$~~
- (d) only a minima at $x = 1$

$$\begin{aligned}f'(x) &= -2x + 2 \\&= -2(x-1)\end{aligned}$$



Use the code: BVREDDY , to get maximum benefits

84. The maximum value of $f(x) = x^3 - 9x^2 + 24x + 5$ in the interval $[1, 6]$ is
- (a) 21 (b) 25 ~~(c) 41~~ (d) 46

GATE- 2012

$$f'(x) = 3x^2 - 18x + 24$$

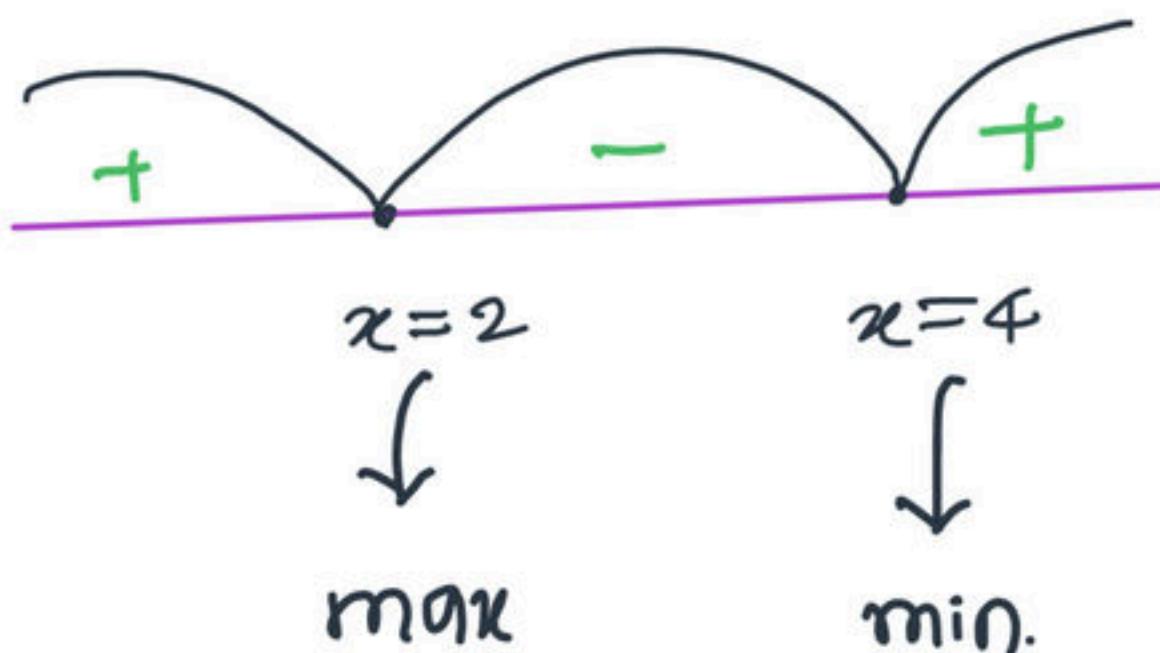
$$x^2 - 6x + 8 = 0$$

$$(x-4)(x-2) = 0$$

$$f(1) = 1 - 9 + 24 + 5 = 21$$

$$f(2) = 8 - 36 + 48 + 5 = 25$$

$$f(6) = 41 \checkmark$$



Use the code: **BVREDDY**, to get maximum benefits

85. At $x = 0$, the function $f(x) = x^3 + 1$ has

(GATE-ME, PI-2012)

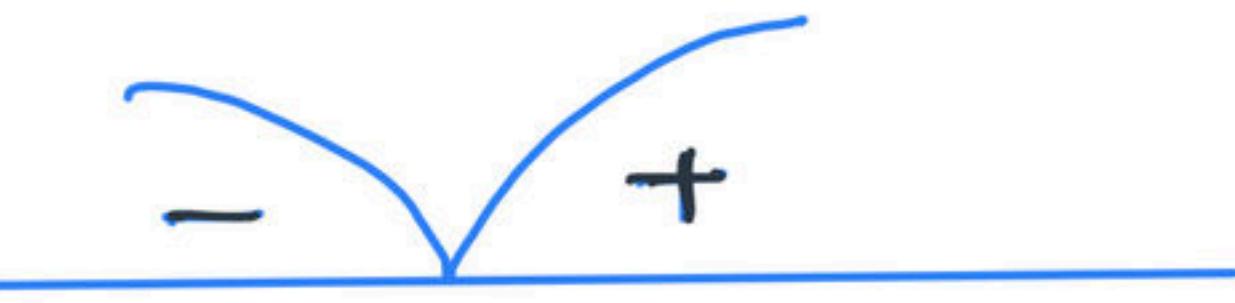
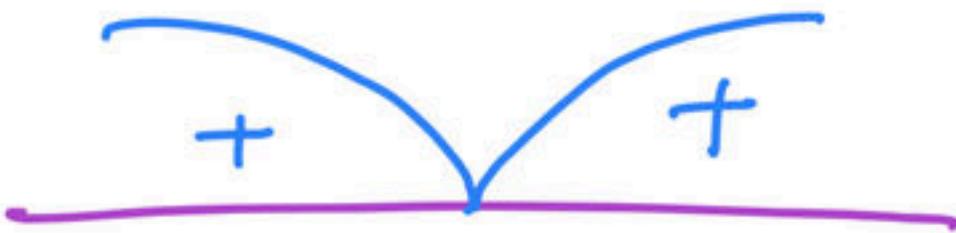
- (a) a maximum value
- (c) a singularity

- (b) a minimum value

- ~~(d) a point of inflection~~

$$f'(x) = 3x^2.$$

$$f''(x) = 6x.$$



$x=0$
Point of inflection

Use the code: BVREDDY , to get maximum benefits

86. For $0 \leq t < \infty$, the maximum value of the function

$$f(t) = e^{-t} - 2e^{-2t}$$
 occurs at

- (a) $t = \log_e 4$
- (b) $t = \log_e 2$
- (c) $t = 0$
- (d) $t = \log_e 8$

87. The maximum value of the function $f(x) = \ln(1+x) - x$ (where $x > -1$) occurs at $x = \underline{\hspace{2cm}}$. **(GATE-EC-SET-3-2014)**

Use the code: BVREDDY , to get maximum benefits

88. The maximum value of $f(x) = 2x^3 - 9x^2 + 12x - 3$ in the interval $0 \leq x \leq 3$ is ____.

GATE-2014

2

Use the code: BVREDDY , to get maximum benefits

89. Let $f(x) = xe^{-x}$. The maximum value of the function in the interval $(0, \infty)$ is
- (a) e^{-1} (b) e (c) $1 - e^{-1}$ (d) $1 + e^{-1}$

GATE-2014

Use the code: BVREDDY , to get maximum benefits

90. Minimum of the real valued function $f(x) = (x-1)^{2/3}$ occurs at x equal to

(a) $-\infty$

(b) 0

(c) 1

(d) ∞

GATE-2014

Use the code: BVREDDY , to get maximum benefits

91. The minimum value of the function $f(x) = x^3 - 3x^2 - 24x + 100$ in the interval $[-3, 3]$ is (GATE-EC-SET-2-2014)

- (a) 20
- (b) 28
- (c) 16
- (d) 32

O

Use the code: BVREDDY , to get maximum benefits

92. While minimizing the function $f(x)$, necessary and sufficient conditions for a point, x_0 to be a minima are : (GATE-CE-2015)

- (a) $f'(x_0) > 0$ and $f''(x_0) = 0$
- (b) $f'(x_0) < 0$ and $f''(x_0) = 0$
- (c) $f'(x_0) = 0$ and $f''(x_0) < 0$
- (d) $f'(x_0) = 0$ and $f''(x_0) > 0$

93. The value of ε in the mean value theorem of $f(b) - f(a) = (b-a) f'(\varepsilon)$ for $f(x) = Ax^2 + Bx + C$ in (a, b) is **(GATE-EC-1994)**

- (a) $b + a$
- (b) $b - a$
- (c) $\frac{b + a}{2}$
- (d) $\frac{b - a}{2}$

Use the code: BVREDDY , to get maximum benefits

94. If $f(0) = 2$ and $f'(x) = \frac{1}{5-x^2}$, then the lower and upper bounds of $f(1)$ estimated by the mean value theorem are _____ $f(x)$ is defined in $[0, 1]$ (GATE-EC-1995)

- (a) 1.9, 2.2 (b) 2.2, 2.25 (c) 2.25, 2.5 (d) None of the above

Use the code: BVREDDY , to get maximum benefits

95. A function $f(x) = 1 - x^2 + x^3$ is defined in the closed interval $[-1, 1]$. The value of x , in the open interval $(-1, 1)$ for which the mean value theorem is satisfied, is

(GATE-EC-2015)

- (a) $-1/2$
- (b) $-1/3$
- (c) $1/3$
- (d) $1/2$

Use the code: BVREDDY , to get maximum benefits

96. If a continuous function $f(x)$ does not have a root in the interval $[a, b]$, then which one of the following statements is TRUE ? **(GATE-EE-2015)**

- (a) $f(a).f(b) = 0$
- (b) $f(a).f(b) < 0$
- (c) $f(a).f(b) > 0$
- (d) $f(a)/f(b) \leq 0$

Use the code: BVREDDY , to get maximum benefits

97. The third term in the taylor's series expansion of e^x about 'a' would be _____

- (a) $e^a (x-a)$ (b) $\frac{e^a}{2} (x-a)^2$ (c) $\frac{e^a}{2}$ (d) $\frac{e^a}{6} (x-a)^3$

GATE -1995

o

Use the code: BVREDDY , to get maximum benefits

98. The taylor's series expansion of $\sin x$ is _____ (GATE-EC-1998)

(a) $1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \dots$

(b) $1 + \frac{x^2}{2!} + \frac{x^4}{4!} + \dots$

(c) $x + \frac{x^3}{3!} + \frac{x^5}{5!} + \dots$

(d) $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \dots$

Use the code: BVREDDY , to get maximum benefits

99. A discontinuous real function can be expressed as

(GATE-CE-1998)

- (a) Taylor's series and Fourier's series
- (b) Taylor's series and not by Fourier's series
- (c) neither Taylor's series nor Fourier's series
- (d) not by Taylor's series, but by Fourier's series

Use the code: BVREDDY , to get maximum benefits

100. The Taylor series expansion of $\sin x$ about $x = \frac{\pi}{6}$ is given by (GATE-CE-2000)

(a) $\frac{1}{2} + \frac{\sqrt{3}}{2} \left(x - \frac{\pi}{6} \right) - \frac{1}{4} \left(x - \frac{\pi}{6} \right)^2 - \frac{\sqrt{3}}{12} \left(x - \frac{\pi}{6} \right)^3 + \dots$

(b) $x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$

(c) $\frac{x - \frac{\pi}{6}}{1!} - \frac{\left(x - \frac{\pi}{6} \right)^3}{3!} + \frac{\left(x - \frac{\pi}{6} \right)^5}{5!} - \frac{\left(x - \frac{\pi}{6} \right)^7}{7!} + \dots$

(d) $\frac{1}{2}$

Use the code: BVREDDY , to get maximum benefits

101. Limit of the following series as x approaches

$$\frac{\pi}{2} \text{ is } f(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$$

- (a) $\frac{2\pi}{3}$ (b) $\frac{\pi}{2}$ (c) $\frac{\pi}{3}$ (d) 1 (GATE-CE-2001)

Use the code: BVREDDY , to get maximum benefits

102. For the function e^{-x} , the linear approximation around $x = 2$ is

(a) $(3-x)e^{-2}$

(b) $1 - x$

(c) $\left[3 + 2\sqrt{2} - (1 + \sqrt{2})x\right]e^{-2}$

(d) e^{-2}

GATE- 2007

Use the code: BVREDDY , to get maximum benefits

103. For $|x| \ll 1$, $\cot h(x)$ can be approximated as **(GATE-EC-2007)**

(a) x

(b) x^2

(c) $\frac{1}{x}$

(d) $\frac{1}{x^2}$

Use the code: BVREDDY , to get maximum benefits

104. The expression $e^{\ln x}$ for $x > 0$ is equal to

- (a) $-x$ (b) x (c) x^{-1} (d) $-x^{-1}$

(GATE-IN-2008)

105. Which of the following function would have only odd powers of x in its Taylor series expansion about the point $x = 0$? **(GATE-EC-2008)**

- (a) $\sin(x^3)$
- (b) $\sin(x^2)$
- (c) $\cos(x^3)$
- (d) $\cos(x^2)$

Use the code: BVREDDY , to get maximum benefits

106. In the Taylor series expansion of $e^x + \sin x$ about the point $x = \pi$, the coefficient of $(x - \pi)^2$ is **(GATE-EC-2008)**

- (a) e^π
- (b) $0.5 e^\pi$
- (c) $e^\pi + 1$
- (d) $e^\pi - 1$

Use the code: BVREDDY , to get maximum benefits

107. In the Taylor series expansion of e^x about $x = 2$, the coefficient of $(x-2)^4$ is
(GATE-ME-2008)

(a) $\frac{1}{4!}$

(b) $\frac{2^4}{4!}$

(c) $\frac{e^2}{4!}$

(d) $\frac{e^4}{4!}$

Use the code: BVREDDY , to get maximum benefits

108. The Taylor series expansion of $\frac{\sin x}{x - \pi}$ at $x = \pi$ is given by (GATE-EC-2010)

(a) $1 + \frac{(x - \pi)^2}{3!} + \dots$

(c) $1 - \frac{(x - \pi)^2}{3!} + \dots$

(b) $-1 - \frac{(x - \pi)^2}{3!} + \dots$

(d) $-1 + \frac{(x - \pi)^2}{3!} + \dots$

Use the code: BVREDDY , to get maximum benefits

109. The infinite series $f(x) = x - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \dots$ Converges to (ME-2010)

- (a) $\cos(x)$
- (b) $\sin(x)$
- (c) $\sin h(x)$
- (d) e^x

Use the code: BVREDDY , to get maximum benefits

110. A series expansion for the function $\sin\theta$ is _____

(GATE-ME-2011)

(a) $1 - \frac{\theta^2}{2!} + \frac{\theta^4}{4!} - \dots$

(b) $\theta - \frac{\theta^3}{3!} + \frac{\theta^5}{5!} - \dots$

(c) $1 + \theta + \frac{\theta^2}{2!} + \frac{\theta^3}{3!} + \dots$

(d) $\theta + \frac{\theta^3}{3!} + \frac{\theta^5}{5!} + \dots$

Use the code: BVREDDY , to get maximum benefits

111. Consider the following inequalities.

- (i) $3p - q < 4$
- (ii) $3q - p < 12$

Which one of the following expressions below satisfies the above two inequalities?

(GATE-2022-PI)

- (a) $8 \leq p + q < 16$
- (b) $p + q = 8$
- (c) $p + q \geq 16$
- (d) $p + q < 8$

Use the code: BVREDDY , to get maximum benefits

112. The infinite series $1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} + \dots$ corresponds to (GATE-CE-2012)
- (a) $\sec x$ (b) e^x (c) $\cos x$ (d) $1 + \sin^2 x$

Use the code: BVREDDY , to get maximum benefits

113. The Taylor series expansion of $3 \sin x + 2\cos x$ is

(GATE-EC-SET-1-2014)

(a) $2 + 3x - x^2 - \frac{x^3}{2} + \dots$

(b) $2 - 3x + x^2 - \frac{x^3}{2} + \dots$

(c) $2 + 3x + x^2 + \frac{x^3}{2} + \dots$

(d) $2 - 3x - x^2 + \frac{x^3}{2} + \dots$

Use the code: BVREDDY , to get maximum benefits

114. In which of the following functions Mean Value theorem is not applicable?

- (i) $y = \frac{1}{x}$, $x \in [-1, 1]$
 - (ii) $y = |x|$, $x \in [-1, 1]$
 - (iii) $y = x \sin \frac{1}{x}$, $x \in \left[+\frac{\pi}{4}, \frac{\pi}{2} \right]$
 - (iv) $y = \sin k \left[0, \frac{\pi}{2} \right]$
- (A) (i), (ii), (iii) (B) (i), (ii)
(C) (i), (iii) (D) (i), (ii), (iii), (iv)

Use the code: **BVREDDY** , to get maximum benefits

115. Which one of the following not the correct statement?

- (a) The function $\sqrt[x]{x}$, ($x > 0$), has the global minimum at $x = e$
- (b) The function $|x|$ has the global minima at $x = 0$
- (c) The function x^3 has neither global minima nor global maxima
- (d) The function $\sqrt[x]{x}$, ($x > 0$), has the global maxima at $x = e$

(GATE-19-CE)

Use the code: BVREDDY , to get maximum benefits

116. The following inequality is true for all x close to zero. $\left(2 - \frac{x^2}{3}\right) < \frac{x\sin x}{1-\cos x} < 2$, what is the value $\lim_{x \rightarrow 0} \frac{x\sin x}{1-\cos x}$?

(GATE-19-CE)

(a) 2

(b) 1

(c) 0

(a) $\frac{1}{2}$

Use the code: BVREDDY , to get maximum benefits

117. If $f(x)$ satisfies Rolles theorem on $[a,b]$, then

the value of $\int_a^b f'(x) dx$ is ____.

- | | |
|-----------------|------------|
| (A) $f(b)-f(a)$ | (B) $f(a)$ |
| (C) $f(b)$ | (D) 0 |

Use the code: **BVREDDY** , to get maximum benefits

118. Consider the polynomial $f(x) = x^3 - 6x^2 + 11x - 6$ on the domain S given by $1 \leq x \leq 3$. the first and second derivatives are $f'(x)$ and $f''(x)$.

Consider the following statements.

- I. The given polynomial is zero at the boundary points $x = 1$ and $x = 3$
- II. There exists one local maxima of $f(x)$ within the domain S.
- III. The second derivative $f''(x) > 0$ throughout the domain S.
- IV. There exists one local minima of $f(x)$ within the domain S.

The correct option is.

(GATE-2022-CE)

- (a) Only statements I, II and III are correct
- (b) Only statements I, II and IV are correct
- (c) Only statements I and IV are correct
- (d) Only statements II and IV are correct

Use the code: BVREDDY , to get maximum benefits

119. The value of the following limit is _____

$$\lim_{x \rightarrow 0^+} \frac{\sqrt{x}}{1 - e^{2\sqrt{x}}}$$

(GATE-2022-CSE)

Use the code: BVREDDY , to get maximum benefits

120. A function $y(x)$ is defined in the interval $[0, 1]$ on the x-axis as

$$y(x) = \begin{cases} 2 & \text{if } 0 \leq x < \frac{1}{3} \\ 3 & \text{if } \frac{1}{3} \leq x \leq \frac{3}{4} \\ 1 & \text{if } \frac{3}{4} \leq x \leq 1 \end{cases}$$

Which one of the following is the area under the curve for the interval $[0, 1]$ on the x-axis?

(GATE-2022-CSE)

- (a) $\frac{5}{6}$
- (b) $\frac{6}{5}$
- (c) $\frac{13}{6}$
- (d) $\frac{6}{13}$

Use the code: BVREDDY , to get maximum benefits

121. Let ‘r’ be a root of the equation $x^2 + 2x + 6 = 0$. Then the value of the expression $(r + 2)(r + 3)(r + 4)(r + 5)$ is?

(GATE-2022-CSE)

- (a) 51
- (b) -51
- (c) 126
- (d) -126

122. Define $[x]$ as the greatest integer less than or equal to x , for each $x \in (-\infty, \infty)$. If $y = [x]$, then area under y for $x \in [1, 4]$ is _____.

- (a) 3
- (b) 1
- (c) 6
- (d) 4

GATE- 2020 (ME)

Use the code: BVREDDY , to get maximum benefits

123. The value of $\lim_{x \rightarrow 1} \left(\frac{1 - e^{-c(1-x)}}{1 - xe^{-c(1-x)}} \right)$

GATE- 2020 (ME)

(a) $c + 1$

(b) $\frac{c+1}{c}$

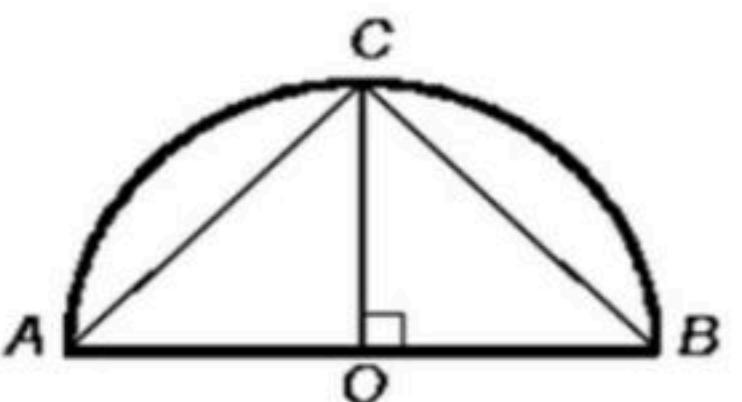
(c) c

(d) $\frac{c}{c+1}$

Use the code: BVREDDY , to get maximum benefits

124. Given a semicircle with O as the centre; as shown in the figure, the ratio $\frac{\overline{AC} + \overline{CB}}{\overline{AB}}$ is _____ . Where \overline{AC} , \overline{CB} and \overline{AB} are chords.

GATE- 2020 (EE)



- (a) $\sqrt{2}$
- (b) $\sqrt{3}$
- (c) 2
- (d) 3

Use the code: BVREDDY , to get maximum benefits

125. The real numbers, x and y with $y = 3x^2 + 3x + 1$, the maximum and minimum value of y for $x \in [-2, 0]$ are respectively _____ .

GATE- 2020 (EE)

- (a) 7 and $\frac{1}{4}$
- (b) 7 and 1
- (c) -2 and $\frac{-1}{2}$
- (d) 1 and $\frac{1}{4}$

Use the code: BVREDDY , to get maximum benefits

GATE- 2020 (CE)

Use the code: BVREDDY , to get maximum benefits

127. Consider the functions:

- I. e^{-x}
- II. $x^2 - \sin x$
- III. $\sqrt{x^3 + 1}$

Which of the above functions is/are increasing everywhere in $[0, 1]$?

- (a) I and III only
- (b) II and III only
- (c) III only
- (d) II only

GATE- 2020 (CS)

Use the code: BVREDDY , to get maximum benefits

128. Consider the function $f(x, y) = x^2 + y^2$. The minimum value of the function attains on the line $x + y = 1$ (rounded off to two decimal places) is _____.

GATE- 2020 (IN)

Use the code: BVREDDY , to get maximum benefits

129. Let $f(x)$ be a real-valued function such that $f'(x_0)=0$ for some $x_0 \in (0,1)$, and $f''(x) > 0$ for all $x \in (0,1)$. Then $f(x)$ has

- (a) exactly one local minimum in $(0,1)$
- (b) one local maximum in $(0,1)$
- (c) no local minimum in $(0,1)$
- (d) two distinct local minima in $(0,1)$

GATE- 2021 (EE)

Use the code: BVREDDY , to get maximum benefits

130. A function, λ , is defined by

$$\lambda(p, q) = \begin{cases} (p - q)^2, & \text{if } p \geq q \\ p + q, & \text{if } p < q \end{cases}$$

GATE- 2021 (CE)

The value of the expression $\frac{\lambda(-(-3+2), (-2+3))}{(-(2+1))}$ is

- (a) $\frac{16}{3}$
- (b) -1
- (c) 0
- (d) 16

Use the code: BVREDDY , to get maximum benefits

131. If $\left(x - \frac{1}{2}\right)^2 - \left(x - \frac{3}{2}\right)^2 = x + 2$, then the value of x is :

GATE- 2021 (CS)

- (a) 2
- (b) 8
- (c) 4
- (d) 6

Use the code: BVREDDY , to get maximum benefits

132. Suppose that $f: R \rightarrow R$ is a continuous function on the interval $[-3, 3]$ and a differentiable function in the interval $(-3, 3)$ such that for every x in the interval. $f'(x) \leq 2$. If $f(-3) = 7$, then $f(3)$ is at most _____.

GATE- 2021 (CS)

Use the code: BVREDDY , to get maximum benefits

133. Consider the following expression:

$$\lim_{x \rightarrow -3} \frac{\sqrt{2x+22}-4}{x+3}$$

GATE- 2021 (CS)

The value of the above expression (rounded to 2 decimal places) is _____.

Use the code: BVREDDY , to get maximum benefits

134. p and q are positive integers and $\frac{p}{q} + \frac{q}{p} = 3$,

GATE- 2021 (CS)

then, $\frac{p^2}{q^2} + \frac{q^2}{p^2} =$

- | | |
|--------|-------|
| (a) 3 | (b) 9 |
| (c) 11 | (d) 7 |

Use the code: BVREDDY , to get maximum benefits

135. A straight line of the form $y = mx + c$ passes through the origin and the point $(x, y) = (2, 6)$. The value of m is _____.

(GATE-16-EC)

Use the code: BVREDDY , to get maximum benefits

136. Consider the function $f(x) = -x^2 + 10x + 100$. The minimum value of the function in the interval $[5, 10]$ is _____. GATE- 2021 (CS)

Use the code: BVREDDY , to get maximum benefits

137. Let $f: [-1,1] \rightarrow \mathbb{R}$, where $f(x) = 2x^3 - x^4 - 10$. The minimum value of $f(x)$ is _____.

(GATE-16-IN)

Use the code: BVREDDY , to get maximum benefits

138. Consider the function $f(x) = 2x^3 - 3x^2$ in the domain $[-1, 2]$. The global minimum of $f(x)$ is _____.

(GATE-16-ME)

Use the code: BVREDDY , to get maximum benefits

139. The values of x for which the function $f(x) = \frac{x^2 - 3x - 4}{x^2 + 3x - 4}$ is NOT continuous are

(GATE-16-ME)

- (a) 4 and -1
- (b) 4 and 1
- (c) -4 and 1
- (d) -4 and -1

Use the code: BVREDDY , to get maximum benefits

140. $\lim_{x \rightarrow 0} \frac{\log_e(1+4x)}{e^{3x}-1}$ is equal to

(GATE-16-ME)

(a) 0

(b) $\frac{1}{12}$

(c) $\frac{4}{3}$

(d) 1

Use the code: BVREDDY , to get maximum benefits

141. $\lim_{x \rightarrow \infty} (\sqrt{x^2 + x - 1} - x)$ is

(GATE-16-ME)

- (a) 0
- (b) ∞
- (c) $\frac{1}{2}$
- (d) $-\infty$

Use the code: BVREDDY , to get maximum benefits

142. At $x = 0$, the function is

$$f(x) = \left| \sin \frac{2\pi x}{L} \right| \quad (-\infty < x < \infty, L > 0)$$

(GATE-16-PI)

- (a) continuous and differentiable.
- (b) not continuous and not differentiable.
- (c) not continuous but differentiable.
- (d) continuous but not differentiable

Use the code: BVREDDY , to get maximum benefits

143. Absolute maxima or minima of a function $f(x)$ occur

- (A) Only at the end point of the curve
- (B) Only at the critical points of the curve
- (C) Both at the end point and critical points of the curve
- (D) Either at the end point or at the critical point of the curve

Use the code: BVREDDY , to get maximum benefits

144. The range of values of k for which the function $f(x) = (k^2 - 4)x^2 + 6x^3 + 8x^4$ has a local maxima at point $x = 0$ is **(GATE-16-PI)**

- (a) $k < -2$ or $k > 2$
- (b) $k \leq -2$ or $k \geq 2$
- (c) $-2 < k < 2$
- (d) $-2 \leq k \leq 2$

Use the code: BVREDDY , to get maximum benefits

145. $\lim_{x \rightarrow 0} \left(\frac{e^{5x}-1}{x} \right)^2$ is equal to _____.

(GATE-16-PI)

Use the code: BVREDDY , to get maximum benefits

$$146. \lim_{x \rightarrow 4} \frac{\sin(x-4)}{x-4} = \underline{\hspace{2cm}}$$

(GATE-16-CSE)

Use the code: BVREDDY , to get maximum benefits

147. The quadratic approximation of $f(x) = x^3 - 3x^2 - 5$ at the point $x = 0$ is

- (a) $3x^2 - 6x + 5$ (b) $-3x^2 - 5$ (c) $-3x^2 + 6x - 5$ (d) $3x^2 - 5$ **(GATE-16-PI)**

Use the code: BVREDDY , to get maximum benefits

148. The minimum value of the function $f(x) = \frac{1}{3}x(x^2 - 3)$ in the interval $-100 \leq x \leq 100$ occurs at $x = \underline{\hspace{2cm}}$.

(GATE-17-EC)

Use the code: BVREDDY , to get maximum benefits

149. Let $f(x) = e^{x+x^2}$ for real x . From among the following. Choose the Taylor series approximation of $f(x)$ around $x = 0$, which includes all powers of x less than or equal to 3.

(GATE-17-EC)

(a) $1 + x + x^2 + x^3$

(b) $1 + x + \frac{3}{2}x^2 + x^3$

(c) $1 + x + \frac{3}{2}x^2 + \frac{7}{6}x^3$

(d) $1 + x + 3x^2 + 7x^3$

Use the code: BVREDDY , to get maximum benefits

150. A function $f(x)$ is defined as $f(x) = \begin{cases} e^x, & x < 1 \\ \ln x + ax^2 + bx, & x \geq 1 \end{cases}$, where $x \in \mathbb{R}$. Which one of the following statements is TRUE?

- (a) $f(x)$ is NOT differentiable at $x = 1$ for any values of a and b . **(GATE-17-EE)**
- (b) $f(x)$ is differentiable at $x = 1$ for the unique values of a and b .
- (c) $f(x)$ is differentiable at $x = 1$ for all values of a and b such that $a + b = e$.
- (d) $f(x)$ is differentiable at $x = 1$ for all values of a and b .

Use the code: BVREDDY , to get maximum benefits

151. Consider the following inequalities.

(i) $2x - 1 > 7$

(ii) $2x - 9 < 1$

Which one of the following expressions below satisfies the above two inequalities?

(GATE-2022-ECE)

(a) $x \leq -4$

(b) $-4 < x \leq 4$

(c) $4 < x < 5$

(d) $x \geq 5$

Use the code: BVREDDY , to get maximum benefits

152. The function $f(x) = 8 \log_e x - x^2 + 3$ attains its minimum over the interval $[1,e]$ at $x = \underline{\hspace{2cm}}$ (Here $\log_e x$ is the natural logarithm of x .) (GATE-2022-ECE)

- (a) 2
- (b) 1
- (c) e
- (d) $\frac{1+e}{2}$

Use the code: BVREDDY , to get maximum benefits

153. In the open interval $(0,1)$, the polynomial $p(x) = x^4 - 4x^3 + 2$ has
- (a) no real roots
 - (b) two real roots
 - (c) one real root
 - (d) three real roots

Use the code: BVREDDY , to get maximum benefits

154. Let $y^2 - 2y + 1 = x$ and $\sqrt{x} + y = 5$. The value of $x + \sqrt{y}$ equals _____. (Given the answer up to three decimal places)

(GATE-17-EE)

Use the code: BVREDDY , to get maximum benefits

155. Rolle's theorem cannot be applicable for

- (A) $f(x) = \sqrt{4 - x^2}$ in $[-2, 2]$
- (B) $f(x) = [x]$ in $[-1, 1]$
- (C) $f(x) = x^2 + 3x - 4$ in $[-4, 1]$
- (D) $f(x) = \cos 2x$ in $[0, \pi]$

Use the code: **BVREDDY**, to get maximum benefits

156. The number C that satisfy the conclusion of mean value theorem for $f(x) = x + (4/x)$ in the interval $[1, 8]$ is
- (a) 4.5
 - (b) 3.5
 - (c) $2\sqrt{2}$
 - (d) 5

Use the code: **BVREDDY**, to get maximum benefits

157. If $f'(x) = \frac{1}{1+x^2}$ for all x & $f(0) = 0$ then an

interval in which $f(2)$ lies, is

- (a) $(2, 4)$
- (b) $(0.4, 2)$
- (c) $(0, 0.4)$
- (d) $(0.1, 0.2)$

158. The value C of Cauchy's mean value theorem for $f(x) = e^x$ and $g(x) = e^{-x}$ in the interval $(2, 3)$ is _____.

159. The Taylor's series expansion of $f(x) = e^{\sin x}$ about $x = 0$, is

(a) $f(x) = 1 + x + \frac{x^2}{2} + \dots$

(b) $f(x) = x + \frac{x^2}{2} + \frac{x^3}{3} + \dots$

(c) $f(x) = 1 - x + \frac{x^2}{2} - \dots$

(d) $f(x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \dots$

Use the code: BVREDDY , to get maximum benefits

160. In the Taylor's series expansion of $f(x) = \log \sec x$
about $x = 0$, coefficient of $x^4 = \underline{\hspace{2cm}}$.

(a) $\frac{1}{12}$

(b) $\frac{1}{14}$

(c) 12

(d) 14

Use the code: BVREDDY , to get maximum benefits

161. The maximum value of the function

$$f(x) = \frac{x^3}{3} - x \text{ occurs at}$$

- (a) 1
- (b) -1
- (c) $\frac{1}{\sqrt{3}}$
- (d) 0

Use the code: **BVREDDY**, to get maximum benefits

162. The maximum value of the function

$$f(x) = x^3 - 6x^2 + 9x + 1 \text{ in } [0, 2] \text{ is } \underline{\hspace{2cm}}.$$

Use the code: BVREDDY , to get maximum benefits

163. The maximum value of the function

$$x^3 + 3xy^2 - 15x^2 - 15y^2 + 72x \text{ is } \underline{\hspace{2cm}}.$$

Use the code: BVREDDY , to get maximum benefits

164. The maximum value of the determinant among all 2×2 real symmetric matrices with trace 10 is _____.

Use the code: BVREDDY , to get maximum benefits

165. Find 'C' of Rolle's Theorem for

$$f(x) = e^x (\sin x - \cos x) \text{ in } [\pi/4, 5\pi/4]$$

(a) $\pi / 2$

(b) $3\pi / 4$

(c) π

(d) does not exist

Use the code: BVREDDY , to get maximum benefits

166. The mean value C of Lagrange's Theorem

for the function $f(x) = 3x^2 + 5x + 8$ in

$$\left[\frac{11}{2}, \frac{13}{2} \right] \text{ is } \underline{\hspace{2cm}}$$

Use the code: BVREDDY , to get maximum benefits

167. If $f(x) = \frac{1}{x}$, $g(x) = \frac{1}{x^2}$ in $[1, 2]$ then the

mean value C of Cauchy's mean value theorem is

- (a) $\frac{4}{3}$
- (b) $\frac{5}{4}$
- (c) $\frac{5}{3}$
- (d) none of these

168. How many of the following functions satisfy Lagrange's mean value theorem in the given interval?

$$f(x) = |x + 2| \quad \text{in } [-2, 0]$$

$$g(x) = 2 + (4 - x)^{1/3} \quad \text{in } [1, 6]$$

$$h(x) = \log(1 + x^3) \quad \text{in } [0, 3]$$

$$p(x) = \begin{cases} 1+x^2, & 0 \leq x < 1 \\ 1, & x = 1 \end{cases}$$

169. Let $f(x)$ and $g(x)$ be differentiable for $0 \leq x \leq 2$ such that $f(0) = 4$, $f(2) = 8$, $g(0) = 0$ and $f'(x) = g'(x)$ for all x in $[0, 2]$ then the value of $g(2)$ must be_____.

Use the code: BVREDDY , to get maximum benefits

170. The function $f(x) = 3x^4 - 4x^3 + 10$ has a minimum value at $x = \underline{\hspace{2cm}}$.

Use the code: BVREDDY , to get maximum benefits

171. The maximum value of the function

$$f(x) = x^3 - 9x^2 + 24x + 5 \text{ in } [1,6] \text{ is}$$

Use the code: BVREDDY , to get maximum benefits

172. If $f(x) = a \log x + bx^2 - x$ has its extreme values at $x = -1$ and $x = 2$ then

- (a) $a = 2, b = -1$
- (b) $a = 2, b = -1 / 2$
- (c) $a = -2, b = 2$
- (d) $a = -2, b = 1 / 2$

Use the code: BVREDDY , to get maximum benefits

173. The function $f(x, y) = x^3 - 3x^2 + 4y^2 - 10$ at $(2,0)$ has

- (a) a maximum
- (b) a minimum
- (c) a saddle point
- (d) both (a) & (b)

Use the code: BVREDDY , to get maximum benefits

174. The function

$$f(x, y) = x^2y - 3xy + 2y + x$$
 has

- (a) no local extremum
- (b) one local minimum but no local maximum
- (c) one local maximum but no local minimum
- (d) one local minimum and one local maximum

Use the code: BVREDDY , to get maximum benefits

175. If $f(x,y) = xy + (x - y)$ then the saddle point
of $f(x, y)$ is

- (a) $(1, -1)$
- (b) $(-1, 1)$
- (c) $(-1, -1)$
- (d) $(1, 1)$

176. The distance between origin and a point nearest to it on the surface $z^2 = 1 + xy$ is

- (a) $\sqrt{3}$
- (b) $\sqrt{2}$
- (c) 1
- (d) none of these

Use the code: **BVREDDY**, to get maximum benefits

177. If $f(x) = x^2 \sin\left(\frac{1}{x}\right)$ then which of the following is true?

- (a) $f'(0)$ exists but $f''(0)$ does not exist
- (b) both $f'(0)$ and $f''(0)$ exist
- (c) neither $f'(0)$ nor $f''(0)$ does not exist
- (d) $f'(0)$ does not exist but $f''(0)$ exists

178. If $f(x) = x \left(1 + \left(\frac{1}{3}\right) \sin(\log x)\right)$ then $f(x)$ is

- (a) continuous at $x = 0$ but not differentiable at $x = 0$
- (b) differentiable at $x=0$ but not continuous at $x = 0$
- (c) continuous and differentiable at $x = 0$
- (d) neither continuous nor differentiable at $x = 0$

Use the code: BVREDDY , to get maximum benefits

179. The function $f(x) = |x| + |x + 1| + |x - 2|$ is differentiable at $x =$

- (a) 1 (b) - 1
 (c) 0 (d) 2

180. Find C of the Rolle's theorem for

$$f(x) = x(x - 1)(x - 2) \text{ in } [1, 2]$$

(a) 1.5

(b) $1 - (1/\sqrt{3})$

(c) $1 + (1/\sqrt{3})$

(d) 1.25

Use the code: BVREDDY , to get maximum benefits

181. Find C of Rolle's theorem for

$$f(x) = (x + 2)^3 (x - 3)^4 \text{ in } [-2, 3]$$

- (a) 1/7
- (b) 2/7
- (c) 1/2
- (d) 3/2

Use the code: **BVREDDY** , to get maximum benefits

182. Find C of the Rolle's theorem for

$$f(x) = e^x \sin x \text{ in } [0, \pi]$$

- (a) $\pi/4$
- (b) $\pi/2$
- (c) $3\pi/4$
- (d) does not exist

Use the code: BVREDDY , to get maximum benefits

$$183. \lim_{x \rightarrow 0} [(e^{2x} - 1) \cot 3x] =$$

- (a) 0
- (b) $\frac{3}{2}$
- (c) 1
- (d) $\frac{2}{3}$

Use the code: **BVREDDY**, to get maximum benefits

184. Find C of Rolle's theorem for

$$f(x) = \log[(x^2 + ab) / (a+b)x] \text{ in } [a,b]$$

- (a) $(a+b)/2$
- . (b) \sqrt{ab}
- (c) $2ab / (a + b)$
- (d) $(b - a)/2$

Use the code: **BVREDDY** , to get maximum benefits

- 185.** Rolle's theorem cannot be applied for the function $f(x) = |x|$ in $[-2, 2]$ because
- (a) $f(x)$ is not continuous in $[-2, 2]$
 - (b) $f(x)$ is not differentiable in $(-2, 2)$
 - (c) $f(-2) \neq f(2)$
 - (d) none of the above

Use the code: BVREDDY , to get maximum benefits

186. Find C of Lagrange's mean value theorem

for $f(x) = \log x$ in $[1, e]$

(a) $e - 2$

(b) $e - 1$

(c) $(e + 1) / 2$

(d) $(e - 1) / 2$

Use the code: BVREDDY , to get maximum benefits

187. Find C of Lagrange's mean value theorem

for $f(x) = lx^2 + mx + n$ in $[a, b]$

- (a) $(a + b) / 2$
- (b) \sqrt{ab}
- (c) $2ab / (a + b)$
- (d) $(b - a)/2$

Use the code: BVREDDY , to get maximum benefits

188. Find C of Lagrange's theorem mean value

theorem for $f(x) = 7x^2 - 13x - 19$ in

$[-11/7, 13/7]$

- (a) $1/7$
- (b) $2/7$
- (c) $3/7$
- (d) $4/7$

Use the code: BVREDDY , to get maximum benefits

189. Find C of Lagrange's mean value theorem

for $f(x) = e^x$ in $[0, 1]$

- (a) 0.5
- (b) $\log(e - 1)$
- (c) $\log(e + 1)$
- (d) $\log[(e + 1)/ (e - 1)]$

Use the code: BVREDDY , to get maximum benefits

190. Find C of Cauchy's mean value theorem for

the functions $1/x$ and $1/x^2$ in $[a, b]$

(a) $(a + b)/2$

(b) \sqrt{ab}

(c) $2ab / (a + b)$

(d) $(b - a)/2$

Use the code: BVREDDY , to get maximum benefits

191. The function $f(x) = 2x^3 - 3x^2 - 36x + 10$ has
a maximum at $x =$

- (a) 3
- (b) 2
- (c) -3
- (d) -2

192. The minimum value of

$$f(x) = 2x^3 - 3x^2 - 36x + 10$$

- (a) 0
 - (b) - 13
 - (c) - 17
 - (d) - 71

Use the code: BVREDDY , to get maximum benefits

193. A maximum value of $f(x) = (\log x / x)$ is

- (a) e
- (b) e^{-1}
- (c) $e - 1$
- (d) $e + 1$

Use the code: BVREDDY , to get maximum benefits

194. The function $f(x) = x^x$ has a minimum at x

- (a) e
- (b) e^{-1}
- (c) 0
- (d) $e + 1$

Use the code: BVREDDY , to get maximum benefits

195. The maximum value of $x \cdot e^{-x}$ is

- (a) e
- (b) e^{-1}
- (c) 1
- (d) $-e$

Use the code: BVREDDY , to get maximum benefits

196. At (a, a) , $f(x, y) = xy + a^3/x + a^3/y$ has

- (a) a maximum
- (b) a minimum
- (c) a maximum if $a > 0$
- (d) neither maximum nor minimum

Use the code: BVREDDY , to get maximum benefits

197. If $f'(x) = (x + 2)(x - 1)^2(2x - 1)(x - 3)$ then
at $x = \frac{1}{2}$, $f(x)$ has
- (a) a maximum
 - (b) a minimum
 - (c) neither maximum nor minimum
 - (d) no stationary point

Use the code: BVREDDY , to get maximum benefits

198. Find the maximum value of $x^2 + y^2 + z^2$

so that $x + y + z = 1$

(a) 1

(b) 1/2

(c) 1/3

(d) 1/4

Use the code: BVREDDY , to get maximum benefits

199. If $f(x) = \begin{cases} 4(3^x), & \text{if } x < 0 \\ 2a + x, & \text{if } x \geq 0 \end{cases}$
is continuous at $x = 0$, then $a = \underline{\hspace{2cm}}$.

Use the code: BVREDDY , to get maximum benefits

200. A function $f(x)$ differentiable in the interval $0 \leq x \leq 5$, is such that $f(0) = 4$ and $f(5) = -1$.

If $g(x) = \frac{f(x)}{x+1}$ then there exists a constant

$c \in (0, 5)$ such that $g'(c) =$

(a) $\frac{-2}{5}$

(b) $\frac{2}{5}$

(c) $\frac{-3}{5}$

(d) $\frac{-5}{6}$

Use the code: BVREDDY , to get maximum benefits

201. If Rolle's Theorem hold for the function

$$f(x) = x^3 + ax^2 + bx \text{ in the interval}$$

$$1 \leq x \leq 2 \text{ at the point } x = \frac{4}{3}$$

then $(a, b) = \underline{\hspace{2cm}}$.

- (a) $(-5, 8)$
- (b) $(-8, -5)$
- (c) $(5, 8)$
- (d) None of the above

Use the code: BVREDDY , to get maximum benefits

202. If $f(x) = \frac{x^3 + 1}{x + 1}$ is continuous at $x = -1$, then

$$f(-1) = \underline{\hspace{2cm}}.$$

Use the code: BVREDDY , to get maximum benefits

203. If $f(x) = \frac{ax + b}{cx + d}$ then $f(x)$ has

- (a) a maximum
- (b) a minimum
- (c) no extremum
- (d) an extremum, if $ad = bc$

Use the code: BVREDDY , to get maximum benefits

204. The function $f(x) = x^{\frac{1}{x}}$ has _____.

- (a) a maximum at $x = e^{-1}$
- (b) a minimum at $x = e^{-1}$
- (c) a maximum at $x = e$
- (d) a minimum at $x = e$

Use the code: BVREDDY , to get maximum benefits

205. $\lim_{x \rightarrow 0} \frac{|x|}{x} = \underline{\hspace{2cm}}$, where $|x|$ is a modulus function

- (a) 0
- (b) 1
- (c) -1
- (d) limit does not exist

Use the code: BVREDDY , to get maximum benefits

206. $\lim_{x \rightarrow 6} [x] = \underline{\hspace{2cm}}$, where $[x]$ is a step

function

- (a) -6
- (b) 5
- (c) 0
- (d) limit does not exist

Use the code: BVREDDY , to get maximum benefits

207. $\lim_{x \rightarrow 0} \frac{x - \sin x}{1 - \cos x} = \underline{\hspace{2cm}}$.

- (a) 0
- (b) 4
- (c) -3
- (d) 1

Use the code: BVREDDY , to get maximum benefits

208. $\lim_{x \rightarrow \frac{\pi}{2}} \left(\sec x - \frac{1}{1 - \sin x} \right) = \underline{\hspace{2cm}}$.

- (a) 0 (b) ∞ (c) -1 (d) 100

Use the code: BVREDDY , to get maximum benefits

209. If $f(x) = \left(\frac{1-x}{x+1}\right)^{\frac{1}{x}}$ is continuous at $x = 0$

then $f(0) =$

- (a) e^{-2}
- (b) e^2
- (c) \sqrt{e}
- (d) $e^{-1/2}$

Use the code: BVREDDY , to get maximum benefits

210. If $f(x) = \begin{cases} ax^2 + 1, & x \leq 1 \\ x^2 + ax + b, & x > 1 \end{cases}$ is differentiable

at $x = 1$ then

- (a) $a = 1, b = 1$
- (b) $a = 1, b = 0$
- (c) $a = 2, b = 0$
- (d) $a = 2, b = 1$

Use the code: BVREDDY , to get maximum benefits

211. The function $f(x) = |x - 4|$ on the interval $[0, 5]$ is
- (a) continuous and differentiable
 - (b) neither continuous nor differentiable
 - (c) differentiable but not continuous
 - (d) continuous on the interval but not differentiable

Use the code: BVREDDY , to get maximum benefits

212. Lagrange's mean value theorem does not

hold for $f(x) = x^{\frac{-2}{3}}$ in $[-1, 1]$, because

- (a) not continuous in $(-1, 1)$
- (b) not differentiable in $(-1, 1)$
- (c) continuous but not differentiable in $(-1, 1)$
- (d) neither continuous nor differentiable in the given interval

Use the code: BVREDDY , to get maximum benefits

213. The value of 'c' of Cauchy's mean value

theorem for $f(x) = \sqrt{x}$ and $g(x) = \frac{1}{\sqrt{x}}$ in

[1, 3] is _____.

- (a) 1.732
- (b) 2.732
- (c) 3.732
- (d) -1.732

214. The coefficient of $(x - 2)^3$ in the Taylor series expansion of the function

$f(x) = \log x$ about the point 2 is

- (a) $\frac{1}{4}$
- (b) $\frac{1}{12}$
- (c) $\frac{1}{24}$
- (d) $\frac{1}{36}$

Use the code: BVREDDY , to get maximum benefits

215. $f(x) = \int_0^x (t-2)^2(t-1)dt$ has a

- (a) maximum at $x = 1$
- (b) minimum at $x = 1$
- (c) maximum at $x = 2$
- (d) minimum at $x = 2$

Use the code: **BVREDDY**, to get maximum benefits

216. Suppose that the function 'f' attains a maximum at $x = x_1$ and a minimum at $x = x_2$ such that $x_2 = x_1^2$.

If $f(x) = 2x^3 - 9ax^2 + 12a^2 x + 1$, $a > 0$ then the value of $a = \underline{\hspace{2cm}}$.

217. If α, β are the roots of the equation
 $x^2 - (a - 2)x - (a + 1) = 0$, where 'a' is a
variable then the minimum value of
 $\alpha^2 + \beta^2 = \underline{\hspace{2cm}}$.

218. Let x and y be integers satisfying the following equations

$$2x^2 + y^2 = 34$$

$$x + 2y = 11$$

The value of $(x + y)$ is _____.

(GATE-17-EE)

Use the code: BVREDDY , to get maximum benefits

219. Let $g(x) = \begin{cases} -x, & x \leq 1 \\ x + 1, & x > 1 \end{cases}$ and

$$f(x) = \begin{cases} 1 - x, & x \leq 0 \\ x^2, & x > 0 \end{cases}$$

Consider the composition of f and g, i.e., $(fog)(x) = f(g(x))$. The number of discontinuities in $(fog)(x)$ present in the interval $(-\infty, 0)$ is

- (a) 0
- (b) 1
- (c) 2
- (d) 4

(GATE-17-EE)

220. The value of $\lim_{x \rightarrow 0} \left(\frac{x^3 - \sin(x)}{x} \right)$ is

- (a) 0
- (b) 0
- (c) 1
- (d) -1

(GATE-17-ME)

Use the code: BVREDDY , to get maximum benefits

221. $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x^2 - x} \right)$ is equal to _____

(GATE-17-CE)

Use the code: BVREDDY , to get maximum benefits

222. The value of $\lim_{x \rightarrow 1} \frac{x^7 - 2x^5 + 1}{x^3 - 3x^2 + 2}$

(GATE-17-CSIT)

- (a) is 0
- (b) is -1
- (c) is 1
- (d) does not exists

Use the code: BVREDDY , to get maximum benefits

223. At the point $x = 0$, the function $f(x) = x^3$ has

- (a) local maximum
- (b) local minimum
- (c) both local maximum and local minimum
- (d) Neither local maximum nor local minimum

(GATE-18-CE)

Use the code: BVREDDY , to get maximum benefits

224. Let $f(x) = 3x^3 - 7x^2 + 5x + 6$. The maximum value of $f(x)$ over the interval $[0, 2]$ is _____ (up to 2 decimal places)

(GATE-18-EE)

Use the code: BVREDDY , to get maximum benefits

225. Consider two functions $f(x) = (x - 2)^2$ and $g(x) = 2x - 1$, where x is real. The smaller value of x for which $f(x) = g(x)$ is _____

(GATE-18-IN)

Use the code: BVREDDY , to get maximum benefits

226. For $0 \leq x \leq 2\pi$, $\sin x$ and $\cos x$ are both decreasing functions in the interval _____
(GATE-18-IN)

(a) $\left(0, \frac{\pi}{2}\right)$

(c) $\left(\pi, \frac{3\pi}{2}\right)$

(a) $\left(\frac{\pi}{2}, 0\right)$

(c) $\left(\frac{\pi}{2}, \pi\right)$

Use the code: BVREDDY , to get maximum benefits

227. A political party orders an arch for the entrance to the ground in which the annual convention is being held. The profile of the arch follows the equation $y = 2x - 0.1x^2$ where y is the height of the arch in meters. The maximum possible height of the arch is

(GATE-ME,PI-2012)

- (a) 8 meters
- (b) 10 meters
- (c) 12 meters
- (d) 14 meters

Use the code: BVREDDY , to get maximum benefits

228. A real-valued function y of real variable x is such that $y = 5|x|$. At $x = 0$, the function is **(GATE-18-PI)**

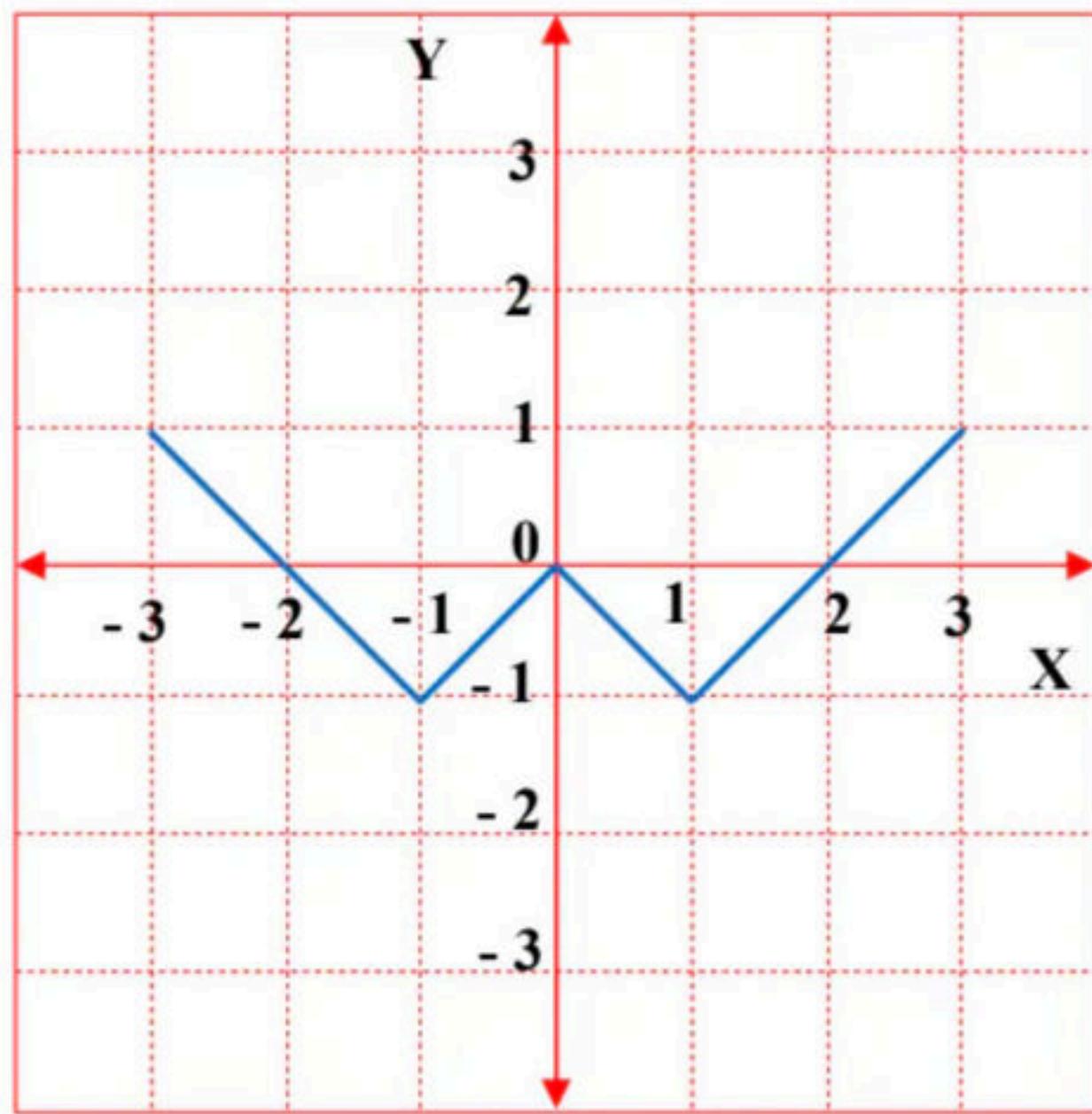
- (a) discontinuous but differentiable
- (b) both continuous and differentiable
- (c) discontinuous and not differentiable
- (d) continuous but not differentiable

Use the code: BVREDDY , to get maximum benefits

229. Which of the following functions describe the graph shown in the below figure?

(GATE-18-PI)

- (a) $y = ||x| + 1| - 2$
- (b) $y = ||x| - 1| - 1$
- (c) $y = ||x| + 1| - 1$
- (d) $y = |x - 1| - 1$



Use the code: BVREDDY , to get maximum benefits

230. Let f be the real-valued function of real variable defined as $f(x) = x^2$ for $x \geq 0$, and $f(x) = -x^2$ for $x < 0$. Which of the following statements is true?

(GATE-18-EE)

- a) $f(x)$ is discontinuous at $x = 0$
- (b) $f(x)$ is continuous but not differentiable at $x = 0$
- (c) $f(x)$ is differentiable, but its first derivative is not continuous at $x = 0$
- (d) $f(x)$ is differentiable, but its first derivative is not differentiable at $x = 0$

Use the code: BVREDDY , to get maximum benefits

231. Let $f(x) = x^{-(1/3)}$ and A denote the area of the region bounded by $f(x)$ and the X-axis, when x varies from -1 to 1 . Which of the following statements is/are TRUE ?

(GATE-CS-2015)

- | | |
|------------------------------------|--------------------------------------|
| (I) f is continuous in $[-1, 1]$ | (II) f is not bounded in $[-1, 1]$ |
| (III) A is nonzero and finite | (a) II only (b) III only |
| (c) II and III only | (d) I, II and III |

Use the code: **BVREDDY**, to get maximum benefits

232. Compute $\lim_{x \rightarrow 3} \frac{x^4 - 81}{2x^2 - 5x - 3}$

(GATE-19-CSIT)

- (a) 1
- (b) Limit does not exist
- (c) 53/12
- (d) 108/7

Use the code: BVREDDY , to get maximum benefits

233.Which of the following is correct?

(a) $\lim_{x \rightarrow 0} \left(\frac{\sin 4x}{\sin 2x} \right) = 2$ and $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x} \right) = 1$

(GATE-19-CE)

(b) $\lim_{x \rightarrow 0} \left(\frac{\sin 4x}{\sin 2x} \right) = \infty$ and $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x} \right) = 1$

(c) $\lim_{x \rightarrow 0} \left(\frac{\sin 4x}{\sin 2x} \right) = 1$ and $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x} \right) = 1$

(d) $\lim_{x \rightarrow 0} \left(\frac{\sin 4x}{\sin 2x} \right) = 2$ and $\lim_{x \rightarrow 0} \left(\frac{\tan x}{x} \right) = \infty$

Use the code: BVREDDY , to get maximum benefits

234. for a small value of h the Taylor series expansion for $f(x + h)$ is

(GATE-19-CE)

(a) $f(x) + hf'(x) + \frac{h^2}{2!} f''(x) + \frac{h^3}{3!} f'''(x) + \dots \infty$

(b) $f(x) - hf'(x) + \frac{h^2}{2} f''(x) - \frac{h^3}{3} f'''(x) + \dots \infty$

(c) $f(x) + hf'(x) + \frac{h^2}{2} f''(x) + \frac{h^3}{3} f'''(x) + \dots \infty$

(d) $f(x) - hf'(x) + \frac{h^2}{2!} f''(x) - \frac{h^3}{3!} f'''(x) + \dots \infty$

Use the code: BVREDDY , to get maximum benefits

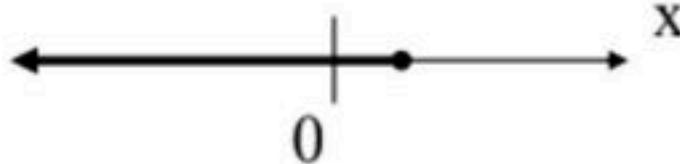
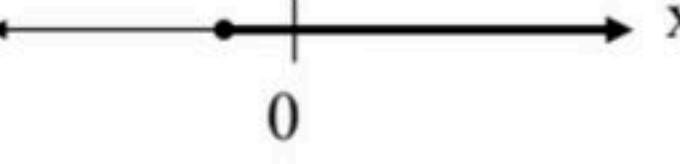
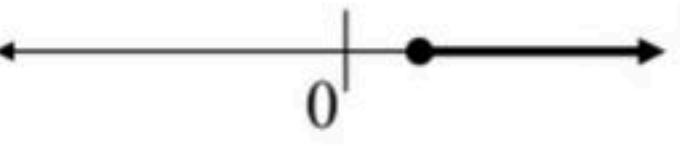
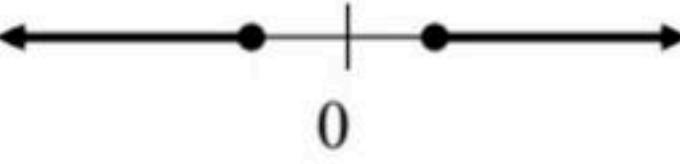
235. The global minimum of $x^3 e^{-|x|}$ for $x \in (-\infty, \infty)$ occurs at $x = \underline{\hspace{2cm}}$ (round off to one decimal place)

(GATE-2022-IN)

Use the code: BVREDDY , to get maximum benefits

236. Which one of the following is a representation (not to scale and in bold) of all values of x satisfying the inequality $2 - 5x \leq -\left(\frac{6x-5}{3}\right)$ on the real number line?

(GATE-2022-ME)

- (a) 
- (b) 
- (c) 
- (d) 

Use the code: BVREDDY , to get maximum benefits

237. The minimum value of $2x+3y$, when $xy=6$ is
(A) 12 (B) 9 (C) 8 (D) 6

Use the code: BVREDDY , to get maximum benefits

238. $f(x) = \frac{1}{4x^2 + 2x + 1}$, then its max value is

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

239. The series $\sum_{m=0}^{\alpha} \frac{1}{4^m} (x-1)^{2m}$ converges for (GATE-IN-2011)
- (a) $-2 < x < 2$ (b) $-1 < x < 3$ (c) $-3 < x < 1$ (d) $x < 3$

Use the code: BVREDDY , to get maximum benefits

240. The series $\sum_{n=0}^{\infty} \frac{1}{n!}$ converges to

(GATE-EC-SET-4-2014)

- (a) $2 \ln 2$
- (b) $\sqrt{2}$
- (c) 2
- (d) e

Use the code: BVREDDY , to get maximum benefits

241. The value of $\sum_{n=0}^{\infty} n \left(\frac{1}{2}\right)^n$ is _____

(GATE-EC-2015)

Use the code: BVREDDY , to get maximum benefits

242. Consider the sequence, $x_n = 0.5x_{n-1} + 1$, $n = 1, 2, \dots$ with $x_0 = 0$. Then $\lim_{n \rightarrow \infty} x_n$ is

- (a) 2
- (b) 1
- (c) 0
- (d) ∞

GATE- 2021 (CS)

Use the code: BVREDDY , to get maximum benefits

243. Let $S = \sum_{n=0}^{\infty} n\alpha^n$ where $|\alpha| < 1$. The value of α in the range $0 < \alpha < 1$, such that $S = 2\alpha$ is

(GATE-16-EE)

Use the code: BVREDDY , to get maximum benefits

244. $f(z) = (z - 1)^{-1} - 1 + (z - 1) - (z - 1)^2 + \dots$ is the series expansion of

(a) $\frac{1}{(z - 1)^2}$ for $|z - 1| < 1$

(b) $\frac{1}{z(z - 1)}$ for $|z - 1| < 1$

GATE- 2021 (CS)

(c) $\frac{-1}{z(z - 1)}$ for $|z - 1| < 1$

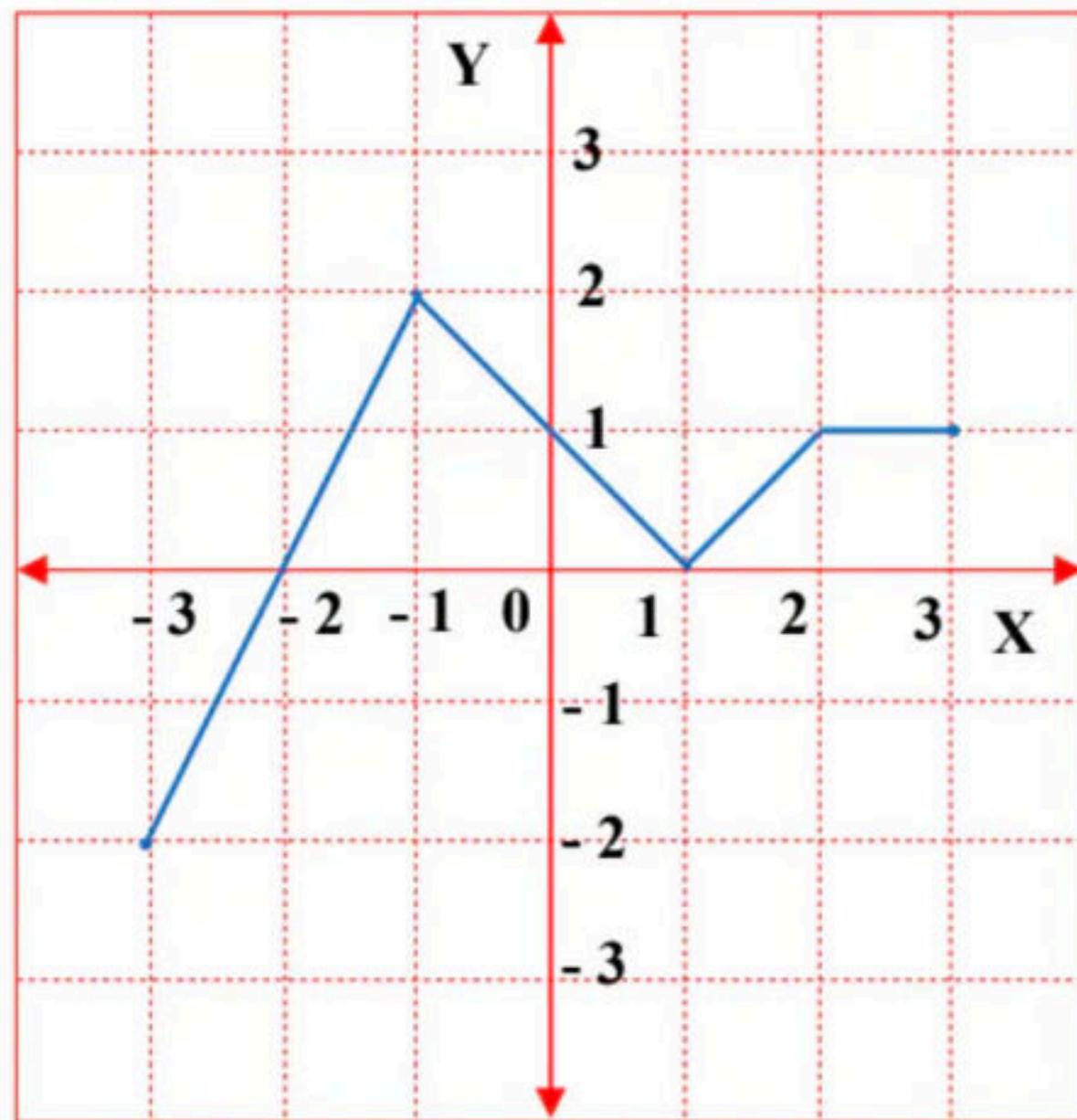
(d) $\frac{-1}{(z - 1)}$ for $|z - 1| < 1$

Use the code: BVREDDY , to get maximum benefits

245. Which of the following function(s) is an accurate description of the graph for the range(s) indicated?

- (i) $y = 2x + 4$ for $-3 \leq x \leq 1$
- (ii) $y = |x - 1|$ for $-1 \leq x \leq 2$
- (iii) $y = ||x| - 1|$ for $-1 \leq x \leq 2$
- (iv) $y = 1$ for $2 \leq x \leq 3$

- (a) (i), (ii) and (iii) only
- (b) (i), (ii) and (iv) only
- (c) (i) and (iv) only
- (d) (ii) and (iv) only



Use the code: **BVREDDY**, to get maximum benefits

246. Consider the following series:

$$\sum_{n=1}^{\infty} \frac{n^d}{c^n}$$

For which of the following combinations of c, d values does this series converge?

(GATE-2022-ECE)

- (a) $c = 1, d = -1$
- (b) $c = 2, d = 1$
- (c) $c = 0.5, d = -10$
- (d) $c = 1, d = -2$

Use the code: BVREDDY , to get maximum benefits

247. Let f be differentiable for all x , if $f(1) = -2$,
and $f'(x) \geq 2$ for all $x \in [1, 6]$ thus
- (A) $f(6) < 8$ (B) $f(6) \geq 8$
(C) $f(6) \geq 5$ (D) $f(6) \leq 5$

Use the code: BVREDDY , to get maximum benefits

Use the code: BVREDDY , to get maximum benefits

$$249. \int_0^2 \int_0^3 xy \, dx \, dy$$

- (A) 0 (B) 9 (C) 8 (D) 1

Use the code: **BVREDDY**, to get maximum benefits

250. $\int_0^{\frac{\pi}{2}} \int_{-1}^1 x^2 y^2 dx dy$

- (A) $\frac{\pi^3}{36}$ (B) $\frac{\pi}{0}$ (C) -1 (D) 0

Use the code: BVREDDY , to get maximum benefits

251. Evaluate $\int_{-1}^2 (1 + |x|) dx$

- (A) 3.5
- (B) 5.5
- (C) 4
- (D) None of these

Use the code: BVREDDY , to get maximum benefits

252. $\int_0^{\pi} \sin^5 x \cos^9 x dx =$ _____

Use the code: BVREDDY , to get maximum benefits

253. Let $f(x)$ be any bounded real valued function in the interval $[a, b]$.

Consider the following statements:

A: $\int_{-a}^a f(x) dx = \int_0^a \{f(x) + f(-x)\} dx$

B: $\int_{-a}^a f(x) dx = 2 \int_0^a f(x) dx$

Then which of the following is appropriate?

- (A) A and B both are true and they are interdependent
- (B) A and B are true independently
- (C) A is true and B is false always
- (D) A is true and B is true in special case

Use the code: BVREDDY , to get maximum benefits

254. For which value of n ,

$\int_0^{\frac{\pi}{2}} \frac{dx}{16\cos^2 x + 25\sin^2 x}$ becomes equal to $n\pi$.

- (A) $\frac{1}{40}$ (B) $\frac{1}{50}$ (C) $\frac{1}{20}$ (D) $\frac{1}{30}$

255. Evaluate $\int_0^1 \int_1^2 (x^2 + y^2) dx dy$

- (A) $\frac{-8}{3}$ (B) $\frac{8}{3}$ (C) 0 (D) 1

Use the code: BVREDDY , to get maximum benefits

256. The value of $\int_{-4}^7 |x| dx$ is

- (a) 30.5
- (b) 30
- (c) 32.5
- (d) 32

Use the code: BVREDDY , to get maximum benefits

257. The value of $\int_0^{1.5} x[x^2] dx$, where $[x]$ is a step function, is

(a) $\frac{4}{3}$

(b) $\frac{1}{2}$

(c) $\frac{2}{3}$

(d) $\frac{3}{4}$

Use the code: BVREDDY , to get maximum benefits

258. The value of $\int_0^{\pi} x \sin^8(x) \cos^6(x) dx$ is

(a) $\frac{\pi^2}{512}$

(b) $\frac{105\pi^2}{512}$

(c) $\frac{105\pi}{86016}$

(d) $\frac{5\pi^2}{4096}$

Use the code: BVREDDY , to get maximum benefits

259. The value of $\int_{x=1}^a \int_{y=1}^b \frac{1}{xy} dx dy$ is _____.

- (a) $(\log a)(\log b)$
- (b) $\log(ab)$
- (c) $\log a - \log b$
- (d) $\log(a + b)$

260. $\int_1^3 \int_1^2 xy^2 \, dx \, dy =$

- (a) 10
- (b) 11
- (c) 13
- (d) 12

Use the code: BVREDDY , to get maximum benefits

$$261. \int_0^1 \int_0^2 \int_0^2 x^2 yz \, dx \, dy \, dz =$$

(a) $-\frac{7}{3}$

(b) $\frac{7}{3}$

(c) $\frac{7}{2}$

(d) $-\frac{7}{2}$

Use the code: BVREDDY , to get maximum benefits

262. The value of $\int_{x=0}^1 \int_{y=0}^2 xy \, dx \, dy$ is _____.

Use the code: BVREDDY , to get maximum benefits

263. $\int_{-\frac{1}{2}}^{\frac{1}{2}} \cos x \log\left(\frac{1+x}{1-x}\right) dx = \underline{\hspace{2cm}}$

Use the code: BVREDDY , to get maximum benefits

264. $\int_{-\pi}^{\pi} \sin^4 x \cdot dx =$

(a) π

(b) $\frac{\pi}{2}$

(c) $\frac{3\pi}{4}$

(d) 0

Use the code: BVREDDY , to get maximum benefits

265. $\int_{-1}^2 \frac{|x|}{x} dx = \dots$

Use the code: BVREDDY , to get maximum benefits

$$266. \int_0^{\pi} |\cos x| dx =$$

Use the code: BVREDDY , to get maximum benefits

267. $\int_0^n [x] dx = \underline{\hspace{2cm}}$, where $[x]$ is a step function

and 'n' is an integer.

(a) $\frac{n(n+1)}{2}$

(b) $\frac{n(n-1)}{2}$

(c) $\frac{n}{2}$

(d) $\frac{n+1}{2}$

Use the code: BVREDDY , to get maximum benefits

268. $\int_0^{\frac{\pi}{2}} \log(\tan x) dx =$

(a) 0

(b) $\frac{\pi}{2}$

(c) $\frac{\pi}{4}$

(d) π

Use the code: BVREDDY , to get maximum benefits

269. Let $\frac{d}{dx}[F(x)] = \frac{e^{\sin x}}{x}$, $x > 0$.

If $\int_1^4 \left(\frac{2e^{\sin x^2}}{x} \right) dx = F(k) - F(1)$

then $k = \underline{\hspace{2cm}}$.

Use the code: BVREDDY , to get maximum benefits

270. $\int_0^{\pi/4} \log(1 + \tan x) dx =$

- (a) 0
- (b) $(\pi/2) \log 2$
- (c) $(\pi/8) \log 2$
- (d) $(-\pi/4) \log 2$

Use the code: BVREDDY , to get maximum benefits

271. $\int_0^{\pi} \sin^4 x \cos^5 x \, dx =$

(a) 0

(b) $3\pi/256$

(c) $3\pi/128$

(d) $5\pi/128$

Use the code: **BVREDDY**, to get maximum benefits

272. $\int_0^{2\pi} \sin^4 x \cos^6 x \, dx =$

- (a) $3\pi/128$
- (b) $3\pi/256$
- (c) $3\pi/64$
- (d) 0

Use the code: **BVREDDY**, to get maximum benefits

$$273. \int_0^{2\pi} \sin^4 x \cos^5 x \, dx =$$

- (a) 0
- (b) $3\pi/128$
- (c) $5\pi/128$
- (d) $3\pi/256$

Use the code: **BVREDDY**, to get maximum benefits

$$274. \int_0^{\pi/2} \int_0^{\pi/2} s \sin(x+y) dx dy$$

(GATE-EC-2000)

(a) 0

(b) π

(c) $\pi/2$

(d) 2

Use the code: BVREDDY , to get maximum benefits

275. The value of the integral is $I = \int_0^{\pi/4} \cos^2 x \, dx$ (GATE-CE-2001)

- (a) $\frac{\pi}{8} + \frac{1}{4}$
- (b) $\frac{\pi}{8} - \frac{1}{4}$
- (c) $\frac{-\pi}{8} - \frac{1}{4}$
- (d) $\frac{-\pi}{8} + \frac{1}{4}$

Use the code: BVREDDY , to get maximum benefits

276.

The value of the integral $\int_{-\pi/2}^{\pi/2} (x \cos x) dx$ is

(GATE-PI-2008)

- (a) 0
- (b) $\pi - 2$
- (c) π
- (d) $\pi + 2$

Use the code: BVREDDY , to get maximum benefits

277. The value of the following definite integral in $\int_{-\pi/2}^{\pi/2} \frac{\sin 2x}{1 + \cos x} dx =$ (GATE-ME-2002)
- (a) -2log 2 (b) 2 (c) 0 (d) None

Use the code: BVREDDY , to get maximum benefits

278. The value of the following improper integral is $\int_0^1 x \log x \, dx =$

(GATE-ME-2002)

- (a) $1/4$ (b) 0 (c) $-1/4$ (d) 1

279.

$$\int_{-a}^a [\sin^6 x + \sin^7 x] dx$$

(GATE-ME-2004)

- (a) $2 \int_0^a \sin^6 x dx$ (b) $2 \int_0^a \sin^7 x dx$ (c) $2 \int_0^a (\sin^6 x + \sin^7 x) dx$ (d) zero

Use the code: BVREDDY , to get maximum benefits

280. The value of $\int_0^3 \int_0^x (6 - x - y) dx dy$ is _____ **(GATE-CS-2008)**

- (a) 13.5
- (b) 27.0
- (c) 40.5
- (d) 54.0

Use the code: BVREDDY , to get maximum benefits

281.

$$\int_0^a \int_0^x \int_0^{x+y} e^{x+y+z} dx dy dz$$

(A) $\frac{e^{4a}}{8} - \frac{3e^{2a}}{4} + e^a - \frac{3}{8}$

(B) $\frac{e^{4a}}{4} - \frac{3e^{2a}}{4}$

(C) $\frac{e^{4a}}{8} - \frac{3e^{2a}}{4} - \frac{3}{8}$

(D) None

Use the code: BVREDDY , to get maximum benefits

282. $\int_0^1 \int_x^{\sqrt{x}} (x^2 + y^2) dx dy =$

(a) $\frac{2}{35}$

(b) $-\frac{3}{35}$

(c) $\frac{3}{35}$

(d) $-\frac{2}{35}$

Use the code: BVREDDY , to get maximum benefits

283.

$$\int_0^1 \int_{4y}^4 e^{x^2} dx dy =$$

(a) $\frac{(e^{16} - 1)}{8}$

(b) $-\frac{(e^{16} + 1)}{8}$

(c) 0

(d) $-\frac{(e^{16} - 1)}{8}$

Use the code: BVREDDY , to get maximum benefits

284.

$$\int_0^4 \int_0^{x^2} e^{y/x} dy dx =$$

(a) $3e^4$

(b) $3e^4 + 7$

(c) $-3e^4$

(d) $3e^4 - 7$

Use the code: BVREDDY , to get maximum benefits

285.

$$\int_0^{\infty} \int_x^{\infty} \left(\frac{e^{-y}}{y} \right) dy dx =$$

(a) 0

(b) 2

(c) 3

(d) 1

Use the code: BVREDDY , to get maximum benefits

$$286. \int_{-1}^1 \int_0^z \int_{x-z}^{x+z} (x + y + z) dx dy dz =$$

(a) 1

(b) 2

(c) 3

(d) 0

Use the code: BVREDDY , to get maximum benefits

287. The integral $\int_0^1 \frac{dx}{\sqrt{(1-x)}}$ is equal to _____.

(GATE-16-EC)

Use the code: BVREDDY , to get maximum benefits

288. $\int_{1/\pi}^{\pi} \frac{\cos(1/x)}{x^2} dx = \underline{\hspace{2cm}}$

(GATE-CS-2015)

Use the code: BVREDDY , to get maximum benefits

289. Given the following statements about a function $f: \mathbb{R} \rightarrow \mathbb{R}$, select the right option:

P: If $f(x)$ is continuous at $x = x_0$, then it is also differentiable at $x = x_0$

Q: If $f(x)$ is continuous at $x = x_0$, then it may not be differentiable at $x = x_0$

R: If $f(x)$ is differentiable at $x = x_0$, then it is also continuous at $x = x_0$

(a) P is true, Q is false, R is false

(GATE-16-EC)

(b) P is false, Q is true, R is true

(c) P is false, Q is true, R is false

(d) P is true, Q is false, R is true

Use the code: BVREDDY , to get maximum benefits

290. The value of $\int_0^{\frac{\pi}{2}} \int_0^{2a\cos\theta} r \sin\theta dr d\theta$

is _____.

(a) $\frac{a^2}{2}$

(b) $2a^2$

(c) $\frac{2a^2}{3}$

(d) $4a^2$

Use the code: BVREDDY , to get maximum benefits

291.

$$\int_0^{\frac{\pi}{4}} \frac{\sin 2x}{\cos^4 x + \sin^4 x} dx = \underline{\hspace{2cm}}$$

Use the code: BVREDDY , to get maximum benefits

292. $\int_0^1 \int_0^{\sqrt{1-x^2}} y^2 dx dy =$

(a) $-\frac{\pi}{16}$

(b) $\frac{\pi}{16}$

(c) $\frac{\pi}{8}$

(d) $-\frac{\pi}{8}$

Use the code: BVREDDY , to get maximum benefits

293. If $[x]$ stands for greatest integer not exceeding 'x', then $\int_4^{10} [x] dx = \underline{\hspace{2cm}}$.

294. Change the order of integration in the

$$\text{integral } I = \int_{-a}^a \int_0^{\sqrt{a^2 - y^2}} f(x, y) dx dy$$

$$(a) I = \int_0^a \int_{-\sqrt{a^2 - x^2}}^{\sqrt{a^2 - x^2}} f(x, y) dy dx$$

$$(b) I = \int_{-a}^a \int_{-\sqrt{a^2 - x^2}}^{\sqrt{a^2 - x^2}} f(x, y) dy dx$$

$$(c) I = \int_0^a \int_{-a}^a f(x, y) dy dx$$

(d) None

Use the code: BVREDDY , to get maximum benefits

295. By reversing the order of integration, the

double integral $\int_0^a \int_{\sqrt{ax}}^a \phi(x, y) dy dx$ is

represented as $\int_p^q \int_r^s \phi(x, y) dx dy$ then the

product of q and s is _____.

- (a) y^2/a
- (b) ay^2
- (c) y^2
- (d) 0

296. Changing the order of integration in double integral $I = \int_0^8 \int_{x/4}^2 f(x, y) dy dx$ leads to

$$I = \int_p^q \int_r^s f(x, y) dy dx . \text{ What is } q? \quad (\text{GATE-EC-2005})$$

- (a) $4y$
- (b) $16y^2$
- (c) x
- (d) 8

297. By reversing the order of integration $\int_0^2 \int_{x^2}^{2x} f(x, y) dy dx$ may be represented as

(a) $\int_0^2 \int_{x^2}^{2x} f(x, y) dy dx$

(b) $\int_0^2 \int_y^{\sqrt{y}} f(x, y) dx dy$

(GATE-EC-1995)

(c) $\int_0^4 \int_{y/2}^{\sqrt{y}} f(x, y) dx dy$

(d) $\int_{x^2}^{2x^2} \int_0^2 f(x, y) dy dx$

Use the code: BVREDDY , to get maximum benefits

298. By a change of variables $x = uv$, $y = v/u$ in a double integral, the integral $f(x,y)$ changes to $f\left(\frac{uv}{v}, \frac{u}{v}\right) \phi(u,v)$. Then $\phi(u,v)$ is _____ (GATE-EE-2005)

- (a) $\frac{2v}{u}$
- (b) $2uv$
- (c) v^2
- (d) 1

Use the code: BVREDDY , to get maximum benefits

299. To evaluate the double integral $\int_0^8 \left(\int_{y/2}^{\left(\frac{y}{2}\right)+1} \left(\frac{2x-y}{2} \right) dx \right) dy$, we make the substitution $u = \left(\frac{2x-y}{2} \right)$ and $v = \frac{y}{2}$. The integral will reduce to

(A) $\int_0^4 \left(\int_0^2 2udu \right) dv$

(C) $\int_0^4 \left(\int_0^1 udu \right) dv$

(B) $\int_0^4 \left(\int_0^1 2udu \right) dv$

(D) $\int_0^4 \left(\int_0^{21} 2udu \right) dv$

Use the code: BVREDDY , to get maximum benefits

300. The values of the integrals $\int_0^1 \left[\int_0^1 \frac{x-y}{(x+y)^3} dy \right] dx$ and $\int_0^1 \left[\int_0^1 \frac{x-y}{(x+y)^3} dx \right] dy$ are

(GATE-17-EC)

- (a) same and equal to 0.5
- (b) same and equal to -0.5
- (c) 0.5 and -0.5, respectively
- (d) -0.5 and -0.5, respectively

Use the code: BVREDDY , to get maximum benefits

301. The value of $\int_1^3 \int_{1/x}^1 \int_0^{\sqrt{xy}} xyz dz dy dx$ is _____

(A) $\frac{13}{9} - \frac{\ln 3}{6}$

(B) $\frac{7}{6} - \frac{\ln 3}{6}$

(C) $\frac{1}{6} - \ln 3$

(D) $\frac{3}{2} - \ln 3$

Use the code: BVREDDY , to get maximum benefits

302. The value of $\int_0^1 \int_0^2 \int_1^2 x^2 y z dz dy dx$ is _____

- (A) 0
- (B) 1
- (C) 2
- (D) 3

Use the code: BVREDDY , to get maximum benefits

303. The Value of the integral $\int_0^1 \int_y^1 y\sqrt{1+x^3} dx dy = \underline{\hspace{2cm}}$

(A) $2\sqrt{2}$

(B) $\frac{2\sqrt{2}-1}{2}$

(C) $\frac{2\sqrt{2}-1}{8}$

(D) $\frac{2\sqrt{2}-1}{9}$

Use the code: BVREDDY , to get maximum benefits

304. The value of $\int_{-1}^2 \int_{x^2}^{x+2} dy dx = \underline{\hspace{2cm}}$

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

(B) $\frac{9}{2}$

(C) $\frac{11}{2}$

(D) $\frac{5}{2}$

Use the code: BVREDDY , to get maximum benefits

305. The value of $\int_0^1 \int_0^1 \frac{dydx}{\sqrt{1-x^2} \sqrt{1-y^2}} = \underline{\hspace{2cm}}$

(A) $\frac{\pi^2}{4}$

(B) $\frac{\pi^2}{2}$

(C) $\frac{\pi^2}{8}$

(D) $\frac{\pi^2}{16}$

Use the code: BVREDDY , to get maximum benefits

306. The value of $\int_0^{100\pi} |\sin x| dx$ is _____

- (A) 100
- (B) 100π
- (C) 200π
- (D) 200

Use the code: BVREDDY , to get maximum benefits

307. The value of integral $\int_{-1}^1 \ln \left(\frac{2-x\cos x}{2+x\cos x} \right) dx$ is _____

- (A) $x \ln(2 + x \cos x)$
- (B) $x \ln(2 - x \cos x)$
- (C) $x \cos x$
- (D) 0

Use the code: BVREDDY , to get maximum benefits

308. If $f(x) = \int_x^0 \sin t^2 dt$ then $f'(x)$ is _____

- (A) $2x \sin x^2$
- (B) $-\sin x^2$
- (C) $2x \cos x^2$
- (D) $\cos x^2$

Use the code: BVREDDY , to get maximum benefits

309. $\lim_{x \rightarrow 0} \frac{1}{x} \int_x^{2x} e^{-t^2} dt$ equals _____.

- (A) does not exists
- (B) infinite
- (C) exists and equals to 1
- (D) exists and equals to 0

Use the code: BVREDDY , to get maximum benefits

310. $\int_0^{\frac{\pi}{4}} \frac{1}{a^2 \cos^2 x + b^2 \sin^2 x} dx = \text{_____} (a > 0)(b > 0)$

(A) $\frac{1}{ab}$

(B) $\frac{1}{ab} \tan^{-1} \left(\frac{b}{a} \right)$

(B) $\frac{1}{ab} \tan^{-1} \left(\frac{a}{b} \right)$

(D) 0

Use the code: BVREDDY , to get maximum benefits

311. $\int_0^1 \frac{\ln(1+x)}{1+x^2} dx$ is

- (A) $\frac{\pi}{4} \ln 2$
- (B) $\frac{\pi}{2} \ln 2$
- (C) $\frac{\pi}{8} \ln 2$
- (D) 0

Use the code: BVREDDY , to get maximum benefits

312. Let D be the determinant

$$\begin{bmatrix} \cos \theta & 1 & 0 \\ 0 & 2\cos \theta & 1 \\ 0 & 1 & 2\cos \theta \end{bmatrix}$$

Then $\int_0^{\frac{\pi}{6}} D d\theta$

- | | |
|---------|---------|
| (A) 1 | (B) 1/3 |
| (C) 4/3 | (D) 3/2 |

313. The integral $\int_0^{\frac{\pi}{2}} \min(\sin x, \cos x) dx$ equals

- (A) $\sqrt{2} - 2$
- (B) $2 - \sqrt{2}$
- (C) $2\sqrt{2}$
- (D) $2 + \sqrt{2}$

Use the code: BVREDDY , to get maximum benefits

314. The value of $\int_0^1 \frac{dx}{\sqrt{x(1-x)}}$ is

- (A) 0
- (B) $\frac{\pi}{2}$
- (C) π
- (D) 2π

Use the code: BVREDDY , to get maximum benefits

315. The value of integral $\int_0^9 \frac{dy}{\sqrt{y}\sqrt{1+\sqrt{y}}}$ is

- (A) 4
- (B) $4(\sqrt{10} - 1)$
- (C) 8
- (D) 12

316. The value of $\int_0^a \int_y^a \frac{x dx dy}{x^2 + y^2}$ is _____

(A) $\frac{\pi a}{4}$

(B) $\frac{\pi a}{8}$

(C) $\frac{\pi a}{2}$

(D) πa

Use the code: BVREDDY , to get maximum benefits

$$317. \int_0^1 \int_0^{x^2} e^{\frac{y}{x}} dy dx = \underline{\hspace{2cm}}$$

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

Use the code: BVREDDY , to get maximum benefits

318. The value of $\int_0^\infty \int_x^\infty \frac{1}{y} e^{-\frac{y}{2}} dy dx = \underline{\hspace{2cm}}$

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

319. The value of $\int_0^a \int_0^x \int_0^y xyz dz dy dx$ is

(A) $\frac{a^4}{16}$

(B) $\frac{a^4}{12}$

(C) $\frac{a^6}{48}$

(D) $\frac{a^4}{4}$

Use the code: BVREDDY , to get maximum benefits

320. The value of $\int_0^1 x^6 \sqrt{1 - x^2} dx$ is

(A) $\frac{5\pi}{256}$

(C) $\frac{5\pi}{512}$

(B) $\frac{5\pi}{128}$

(D) $\frac{3\pi}{512}$

Use the code: BVREDDY , to get maximum benefits

321. The value of $\int_{x=0}^1 \int_{y=0}^{x^2} \int_{z=0}^y (y + 2z) dz dy dx$ is

- (A) $\frac{1}{53}$
- (B) $\frac{2}{21}$
- (C) $\frac{1}{6}$
- (D) $\frac{5}{3}$

Use the code: BVREDDY , to get maximum benefits

322. Let $E = \{(x,y) \in R^2, 0 < x < y, 0 < y < \infty\}$ then $\int \int_E ye^{-(x+y)} dx dy = \underline{\hspace{1cm}}$

Use the code: BVREDDY , to get maximum benefits

323. Let $\int_0^1 \int_y^1 x y \sin(xy) dx dy = \int_0^1 \int_a^b x y \sin(xy) dy dx$ then

- (A) $a = 0, b = x$
- (B) $a = 1, b = x$
- (C) $a = 0, b = 1$
- (D) $a = -1, b = x$

Use the code: BVREDDY , to get maximum benefits

324. The integral $\int_0^1 \int_{x^2}^x \left(\frac{x}{y}\right) e^{-\frac{x^2}{y}} dy dx$ equals

- (A) $(e - 2)/e$
- (B) $(e - 1)/2e$
- (C) $(e - 1)/2$
- (D) $(e - 2)/2e$

Use the code: BVREDDY , to get maximum benefits

325. Differentiate with respect to t. $f(t) = \int_{-t^2}^{\alpha} e^{-x^2} dx$

(A) $2te^{-t^4}$

(B) $2te^{t^4}$

(C) $-2te^{t^4}$

(D) $-2te^{-t^4}$

Use the code: BVREDDY , to get maximum benefits

326. The area of the region enclosed by the curve $y = x^2$ and the straight-line $x + y = 2$ is

- (A) 3
- (B) $27/2$
- (C) $9/2$
- (D) 9

Use the code: BVREDDY , to get maximum benefits

327. The area of the region bounded by the curve $x^2 = 2y$ and $y^2 = 2x$ is

- (A) $1/3$
- (B) $2/3$
- (C) $4/3$
- (D) 4

Use the code: BVREDDY , to get maximum benefits

328. Area enclosed by the curves $y^2 = x$ and $y^2 = 2x - 1$ lying in the first quadrant is

- (A) $1/6$
- (B) $1/4$
- (C) $1/2$
- (D) $1/3$

Use the code: BVREDDY , to get maximum benefits

329. The value of $\int \int xy(x + y)dx dy$ over the area between $y = x^2$ and $y = x$

- (A) $1/90$
- (B) $1/45$
- (C) $3/56$
- (D) $1/15$

Use the code: BVREDDY , to get maximum benefits

- 330.** The area bounded by the parabola $2y = x^2$ and the lines $x = y - 4$ is equal to
(a) 6 (b) 18 (c) ∞ (d) None **(GATE-ME-1995)**

Use the code: BVREDDY , to get maximum benefits

331. Area bounded by the curve $y = x^2$ and the lines $x = 4$ and $y = 0$ is given by

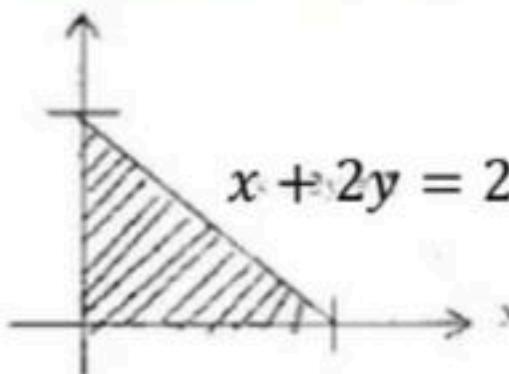
- (a) 64 (b) $\frac{64}{3}$ (c) $\frac{128}{3}$ (d) $\frac{128}{4}$ (GATE-EE-1997)

Use the code: BVREDDY , to get maximum benefits

332. The area enclosed between the parabola $y = x^2$ and the straight line $y = x$ is
- (a) $1/8$ (b) $1/6$ (c) $1/3$ (d) $1/2$

Use the code: BVREDDY , to get maximum benefits

333. Consider the shaded triangular region P shown in the figure. What is $\iint_P xy \, dx \, dy$?



(GATE-ME-2008)

- (a) $\frac{1}{6}$
- (b) $\frac{2}{9}$
- (c) $\frac{7}{16}$
- (d) 1

Use the code: BVREDDY , to get maximum benefits

334. Consider the following definite integral

$$I = \int_0^1 \frac{(\sin^{-1}x)^2}{\sqrt{1-x^2}} dx$$

The value of the integral is

(GATE-17-CE)

(a) $\frac{\pi^3}{24}$

(b) $\frac{\pi^3}{12}$

(c) $\frac{\pi^3}{48}$

(d) $\frac{\pi^3}{64}$

Use the code: BVREDDY , to get maximum benefits

335. Let x be a continuous variable defined over the interval $(-\infty, \infty)$ and $f(x) = e^{-x-e^{-x}}$. The integral $g(x) = \int f(x)dx$ is equal to

(GATE-17-CE)

- (a) e^{e-x}
- (b) $e^{-e^{-x}}$
- (c) e^{-e^x}
- (d) e^{-x}

Use the code: BVREDDY , to get maximum benefits

336. The volume under the surface $z(x, y) = x + y$ and above the triangle in the xy plane defined by $\{0 \leq y \leq x \text{ and } 0 \leq x \leq 12\}$ is _____. (GATE-EC-SET-1-2014)

Use the code: **BVREDDY**, to get maximum benefits

337. The volume generated by revolving the area bounded by the parabola $y^2 = 8x$ and the line $x = 2$ about y-axis is **(GATE-EE-1994)**

- (a) $\frac{128\pi}{5}$
- (b) $\frac{5}{128\pi}$
- (c) $\frac{127}{5\pi}$
- (d) None of the above

Use the code: BVREDDY , to get maximum benefits

338. The volume of an object expressed in spherical co-ordinates is given by

$$V = \int_0^{2\pi} \int_0^{\pi/3} \int_0^1 r^2 \sin\phi \, dr \, d\phi \, d\theta. \text{ The value of the integral } \quad (\text{GATE-EE-2004})$$

(a) $\frac{\pi}{3}$

(b) $\frac{\pi}{6}$

(c) $\frac{2\pi}{3}$

(d) $\frac{\pi}{4}$

Use the code: BVREDDY , to get maximum benefits

339. The volume enclosed by the surface $f(x, y) = e^x$ over the triangle bounded by the line $x = y$, $x = 0$, $y = 1$ in the xy plane is _____ (GATE-EE-2015)

Use the code: BVREDDY , to get maximum benefits

340. The region specified by

$$\left\{ (\rho, \varphi, z) : 3 \leq \rho \leq 5, \frac{\pi}{8} \leq \varphi \leq \frac{\pi}{4}, 3 \leq z \leq 4.5 \right\}$$

in cylindrical coordinates has volume of _____.

(GATE-16-EC)

Use the code: BVREDDY , to get maximum benefits

341. How many distinct values of x satisfy the equation $\sin x = \frac{x}{2}$, where x is in radians? **(GATE-16-EC)**

- (a) 1
- (b) 2
- (c) 3
- (d) 4 or more

Use the code: BVREDDY , to get maximum benefits

342. A triangle in the x-y plane is bounded by the straight lines $2x = 3y$, $y = 0$ and $x = 3$. The volume above the triangle and under the plane $x + y + z = 6$ is _____.

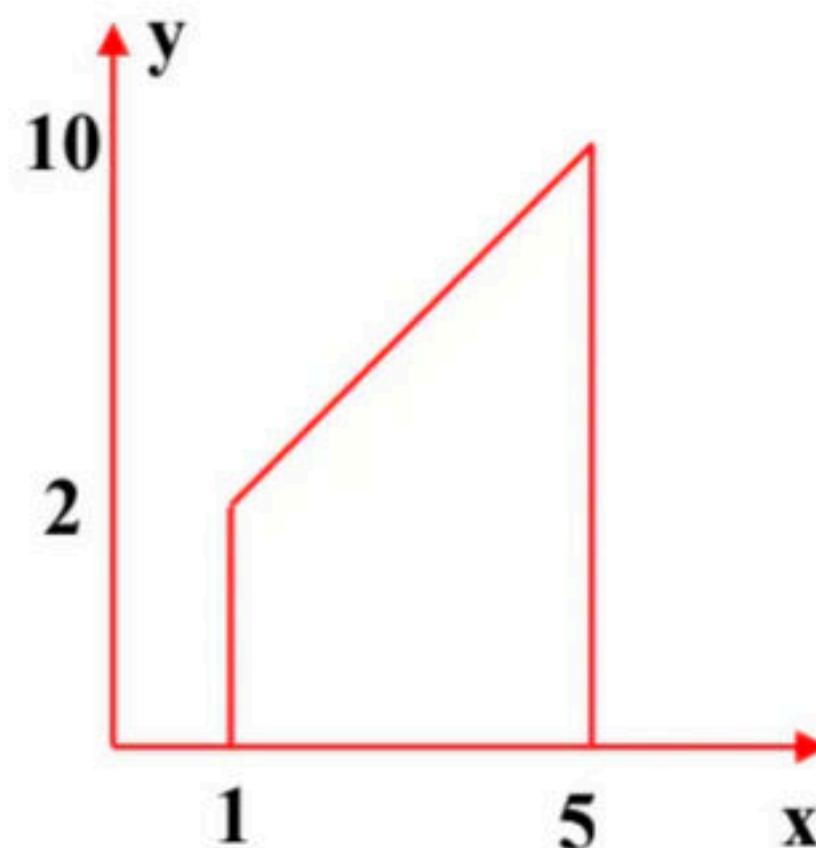
(GATE-16-EC)

Use the code: BVREDDY , to get maximum benefits

343. Let $I = c \iint_R xy^2 dx dy$, where R is the region shown in the figure and $C = 6 \times 10^{-4}$. The value of I equals _____.

(Give the answer up to two decimal places)

(GATE-17-EE)



Use the code: BVREDDY , to get maximum benefits

344. if $f(x) = R \sin\left(\frac{\pi x}{2}\right) + S$, $f'\left(\frac{1}{2}\right) = \sqrt{2}$ and $\int_0^1 f(x) dx = \frac{2R}{\pi}$, then constants R and S are respectively.

(GATE-17-CSIT)

(a) $\frac{2}{\pi}$ and $\frac{16}{\pi}$

(b) $\frac{2}{\pi}$ and 0

(c) $\frac{4}{\pi}$ and 0

(b) $\frac{4}{\pi}$ and $\frac{16}{\pi}$

Use the code: BVREDDY , to get maximum benefits

345. The value of the integral $\int_0^{\pi} x \cos^2 x dx$ is

(GATE-18-CE)

(a) $\frac{\pi^2}{8}$

(b) $\frac{\pi^2}{4}$

(c) $\frac{\pi^2}{2}$

(d) π^2

Use the code: BVREDDY , to get maximum benefits

346. The value of $\int_0^{\frac{\pi}{4}} x \cos(x^2) dx$ correct to 3 decimal places (assuming $\pi = 3.14$) is _____

(GATE-18-CSIT)

Use the code: BVREDDY , to get maximum benefits

347. The value of the integral $\int_0^{\pi} \int_y^{\pi} \frac{\sin x}{x} dx dy$ is equal

(GATE-19-CSIT)

Use the code: BVREDDY , to get maximum benefits

348. A parabola $x = y^2$ with $0 \leq x \leq 1$ is shown in the figure. The volume of the solid of rotation obtained by rotating the shaded area by 360° around the x-axis is

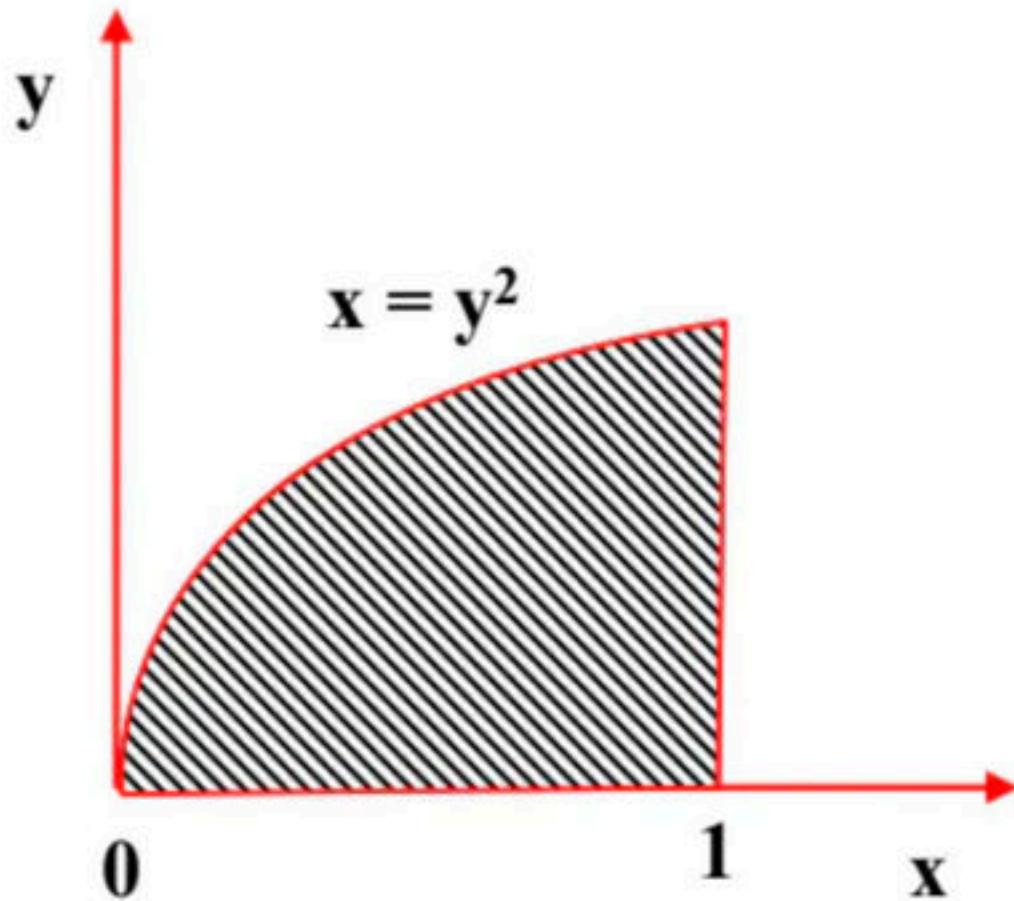
(GATE-19-ME)

(a) π

(b) $\frac{\pi}{4}$

(c) 2π

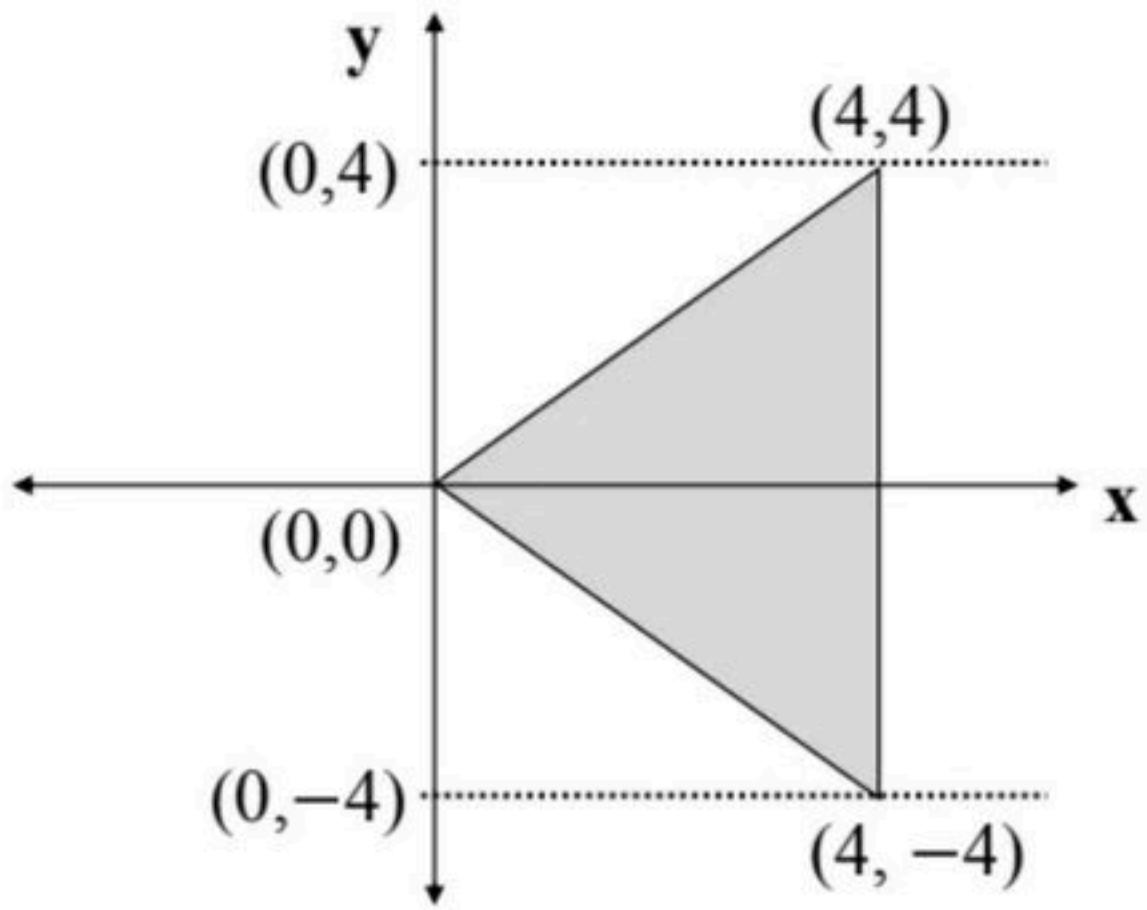
(d) $\frac{\pi}{2}$



Use the code: BVREDDY , to get maximum benefits

349. The value of the integral $\iint_D 3(x^2 + y^2) dx dy$
where D is the shaded triangular region shown in the diagram is _____ (rounded off nearest integer).

(GATE-2022-ECE)



Use the code: BVREDDY , to get maximum benefits

350. If $f(x) = 2\ln(\sqrt{e^x})$, what is the area bounded by $f(x)$ for the interval $[0, 2]$ on the x-axis **(GATE-2022-ME)**

- (a) $\frac{1}{2}$
- (b) 1
- (c) 2
- (d) 4

Use the code: BVREDDY , to get maximum benefits

351. The volume of the solid revolution generated by revolving the area bounded by the curve $y = \sqrt{x}$ and the straight lines $x=4$, $y=0$ about the x-axis, is _____

- (A) 2π
- (B) 4π
- (C) 8π
- (D) 12π

Use the code: BVREDDY , to get maximum benefits

352. The volume of the revolution of $y = \frac{a}{2} \left(e^{\frac{x}{a}} + e^{-\frac{x}{a}} \right)$ about x axis between $x = 0$ and $x = b$ is

(A) $\frac{\pi a^3}{8} \left(e^{\frac{2b}{a}} - e^{-\frac{2b}{a}} \right) - \frac{\pi a^2 b}{2}$

(C) $-\frac{\pi a^3}{8} \left(e^{\frac{2b}{a}} - e^{-\frac{2b}{a}} \right) - \frac{\pi a^2 b}{2}$

(B) $-\frac{\pi a^3}{8} \left(e^{\frac{2b}{a}} - e^{-\frac{2b}{a}} \right) + \frac{\pi a^2 b}{2}$

(D) $\frac{\pi a^3}{8} \left(e^{\frac{2b}{a}} - e^{-\frac{2b}{a}} \right) + \frac{\pi a^2 b}{2}$

Use the code: BVREDDY , to get maximum benefits

353. Let V be the region bounded by the planes $x = 0$, $x = 2$, $y = 0$, $z = 0$ and $y + z = 1$. Then the value of the integral $\iiint_V y \, dx \, dy \, dz$ is

- (A) $1/2$
- (B) $4/3$
- (C) 1
- (D) $1/3$

Use the code: BVREDDY , to get maximum benefits

354. Find the volume under the plane $z = 8x + 6y$ over the region

$R = \{(x,y): 0 \leq x \leq 1, 0 \leq y \leq 2x^2\}$ is _____

(A) $\frac{16}{5}$

(B) $\frac{32}{5}$

(C) 16

(D) 32

Use the code: BVREDDY , to get maximum benefits

355. The value of $\int_0^{\infty} e^{-y^3} \cdot y^{1/2} dy$ is _____

(GATE-ME-1994)

Use the code: BVREDDY , to get maximum benefits

356. For $\lambda > 0$, the value of integral $\int_0^\infty e^{-\lambda x^2} dx$ equals

(A) $\frac{1}{2} \sqrt{\frac{\pi}{\lambda}}$

(C) $\sqrt{\frac{2\pi}{\lambda}}$

(B) $\sqrt{\frac{\pi}{2\lambda}}$

(D) $2 \sqrt{\frac{\pi}{\lambda}}$

Use the code: BVREDDY , to get maximum benefits

357. The value of the double integral $\int_0^{1/x} \int_x^{1/x} \frac{x}{1+y^2} dx dy = \underline{\hspace{2cm}}$ (GATE-EC-1993)

Use the code: BVREDDY , to get maximum benefits

358. Given $\int_{-\infty}^{\infty} e^{-x^2} dx = \sqrt{\pi}$. If a and b are integers, the value of $\int_{-\infty}^{\infty} e^{-a(x+b)^2} dx$ is _____ (GATE-2022-ME)

- (a) $\sqrt{a\pi}$
- (b) $\sqrt{\frac{\pi}{a}}$
- (c) $b\sqrt{\pi a}$
- (d) $b\sqrt{\frac{\pi}{a}}$

Use the code: BVREDDY , to get maximum benefits

359. The value of the integral $\int_{-\infty}^0 e^{-\left(\frac{x^2}{20}\right)} dx$ is _____

- (A) $1/2$
- (B) $-\sqrt{5\pi}$
- (C) $\sqrt{10}$
- (D) π

Use the code: BVREDDY , to get maximum benefits

360. Evaluate: $\lim_{x \rightarrow 0} \frac{1}{x^{191}}$

- (A) ∞
- (B) 0
- (C) $-\infty$
- (D) None of these

Use the code: BVREDDY , to get maximum benefits

361. Which of the following is true?

- (A) Every continuous function has derivative at every point
- (B) Every differentiable function may not be continuous everywhere
- (C) Every differentiable function is automatically continuous
- (D) A function is continuous iff it is differentiable

Use the code: BVREDDY , to get maximum benefits

362. Which of the following options are necessary so that a function is differentiable at a particular point x ?

- (i) The existence of function at x
 - (ii) Existence of either right-handed or left-handed derivative or both
 - (iii) Continuity of the function at that particular point, x
 - (iv) Existence of both right-handed and left-handed derivative at x
 - (v) Existence and equality of both right-handed and left-handed derivative at x
- | | |
|----------------|-----------------|
| (A) (i), (v) | (B) (iii), (iv) |
| (C) (i), (iii) | (D) (i), (ii) |

Use the code: BVRUEDDY , to get maximum benefits

363. The function $f(x) = |x - 4|$ on the interval $[0, 5]$ is

- (a) continuous and differentiable
- (b) neither continuous nor differentiable
- (c) differentiable but not continuous
- (d) continuous on the interval but not differentiable

Use the code: BVREDDY , to get maximum benefits

364. Evaluate: $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x}$

(A) 0 (B) 1 (C) 2 (D) ∞

Use the code: BVREDDY , to get maximum benefits

365. Consider the following statements:

S1: $f(x) = \cos|x|$ is continuous at $x = 0$

S2: $f(x) = \cos|x|$ is differentiable at $x = 0$

- (A) S1 and S2 both are true
- (B) S1 is true, S2 is false
- (C) S1 is false, S2 is true
- (D) Both are false

366. Consider the following function:

$$\begin{aligned}f(x) &= e^x \sin x \quad (x \neq 0) \\&= 0 \quad (x = 0)\end{aligned}$$

Which of the following is true?

- (A) f is differentiable and hence continuous at $x = 0$
- (B) f is continuous but not differentiable at $x = 0$
- (C) f is neither continuous nor differentiable at $x = 0$
- (D) f is differentiable but not continuous at $x = 0$

367. Consider the function: $f(x) = [x] + 1$ over positive integer including 0.

Then the total number of point of discontinuities of $f(x)$ are,

- (A) 1
- (B) Infinite
- (C) 0
- (D) None of these

368.

Consider the following function:

$$f(x) = x + |x| + 5$$

Which of the following is true?

- (A) f is continuous and differentiable at
 $x = 0$
- (B) f is continuous but not differentiable at
 $x = 0$
- (C) f is differentiable but not continuous at
 $x = 0$
- (D) f is neither differentiable nor
continuous at $x = 0$

Use the code: BVREDDY , to get maximum benefits

369. The derivative of nth - root function

$$f(x) = \sqrt[n]{x}$$
 is,

(A) $\frac{1}{n} x^{\frac{1}{n}-1}$

(B) nx^{n-1}

(C) $\frac{1}{n} x^{n-1}$

(D) $\sqrt{n} x^{\sqrt{n}-1}$

Use the code: BVREDDY , to get maximum benefits

370. Which of the following points are least essential so that Mean Value theorem will be valid for the function $f(x)$?

- (A) Continuity and differentiability of $f(x)$ in the interval including end-points
- (B) Continuity and differentiability of $f(x)$ in the interval excluding the end points
- (C) Continuity in closed interval and differentiability in the open interval
- (D) Only differentiability in closed interval

Use the code: BVREDDY , to get maximum benefits

371. $\lim_{x \rightarrow 0} \frac{\sqrt[k]{1+x} - 1}{x}$ (k is a positive integer)

- (A) k (B) -k (C) $\frac{1}{k}$ (D) $-\frac{1}{k}$

Use the code: **BVREDDY**, to get maximum benefits

372. $\lim_{x \rightarrow 1} \frac{x^2 - \sqrt{x}}{\sqrt{x} - 1}$

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

Use the code: BVREDDY , to get maximum benefits

373. $\lim_{x \rightarrow 0} \frac{\sqrt[3]{1+x} - \sqrt[3]{1-x}}{x} =$

- (A) $\frac{1}{3}$ (B) $\frac{2}{3}$ (C) 0 (D) 1

Use the code: BVREDDY , to get maximum benefits

374.

$$\lim_{x \rightarrow a} \frac{x^{\frac{5}{8}} - a^{\frac{5}{8}}}{x^{\frac{1}{3}} - a^{\frac{1}{3}}} =$$

(A) $\frac{15}{8} a^{\frac{7}{24}}$

(C) $\frac{-15}{8} a^{\frac{7}{24}}$

(B) $\frac{15}{4} a^{\frac{7}{24}}$

(D) $\frac{15}{4} a^{\frac{-7}{24}}$

Use the code: BVREDDY , to get maximum benefits

375. $\lim_{x \rightarrow 0} \frac{\sin 3x \tan 4x}{x \sin 5x}$

- (A) 1 (B) $\frac{5}{12}$ (C) 0 (D) $\frac{12}{5}$

Use the code: BVREDDY , to get maximum benefits

376. $\lim_{x \rightarrow 0} \frac{(1 - e^x) \sin x}{x^2 + x^3} =$

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

Use the code: BVREDDY , to get maximum benefits

377. $\lim_{x \rightarrow \frac{\pi}{2}} \frac{\left(\frac{\pi}{2} - x\right) \sec x}{\cos \sec x} =$

- (A) 1 (B) 0 (C) -1 (D) $\frac{1}{\pi}$

Use the code: BVREDDY , to get maximum benefits

378. $\lim_{x \rightarrow 0} \frac{4^x - 9^x}{x(4^x + 9^x)} = \underline{\hspace{2cm}}$

(A) $\ln\left(\frac{3}{2}\right)$

(B) $\ln\left(\frac{2}{3}\right)$

(C) $\ln\left(\frac{4}{3}\right)$

(D) $\ln 2$

Use the code: BVREDDY , to get maximum benefits

379.

$$\lim_{x \rightarrow 0} \frac{a^{\tan x} - 1}{x} =$$

- (A) a (B) 1 (C) $2 \ln a$ (D) $\ln a$

Use the code: BVREDDY , to get maximum benefits

380. The function $f(x) = (1+x)^{\frac{5}{x}}$ for $x \neq 0$
 $= e^5$ for $x = 0$

then

- (A) $f(x)$ is continuous at $x=0$
- (B) right continuous at $x=0$
- (C) left continuous at $x=0$
- (D) cannot be determined

381. Evaluate: $\lim_{n \rightarrow \infty} \frac{n^2 + 1}{n^2 + n + 1}$

- (A) Undefined
- (B) 1
- (C) 0
- (D) None of these

Use the code: BVREDDY , to get maximum benefits

382. Evaluate: $\lim_{x \rightarrow 7} \left[\frac{x^6 - 7^6}{x - 7} + \frac{x^2 - 7^2}{x - 7} \right]$

- (A) 327040 (B) 100856
(C) ∞ (D) None of these

Use the code: BVREDDY , to get maximum benefits

383.

Evaluate: $\lim_{x \rightarrow 0} \frac{2 \sin^4 \frac{x}{2}}{\left(x^4\right)^2}$

(A) 16

(B) $\frac{1}{2}$

(C) not exist

(D) $\frac{1}{4}$

Use the code: BVREDDY , to get maximum benefits

384. Consider the statements:

S1: $f(x) = x + [x]$, $x \in \mathbb{Z}$ is not continuous
at $x = 0$

S2: $\lim_{x \rightarrow 0^+} f'(x) = \lim_{x \rightarrow 0^-} f'(x)$

- (A) S1 and S2 both are false
- (B) S1 is true, S2 is false
- (C) S1 is false, S2 is true
- (D) S1 and S2 both are true but S2 is not the correct explanation of S1

Use the code: BVREDDY , to get maximum benefits

385. Evaluate: $\lim_{x \rightarrow 0} \frac{e^{2x} - 1}{\log(1 + x)}$

- (A) 0 (B) 2 (C) 4 (D) $\frac{1}{2}$

Use the code: **BVREDDY**, to get maximum benefits

386. Evaluate: $\lim_{x \rightarrow 0} \left(\frac{1}{\sin x} - \frac{1}{x} \right)$

- (A) 0 (B) ∞ (C) 1 (D) $\frac{\pi}{2}$

Use the code: BVREDDY , to get maximum benefits

387. $f(x) = \frac{x^2 - 4}{x - 2}$, ($x \neq 2$) and $f(x) = a$ at $x = 2$

Then, which of the following is true?

- (A) $f(x)$ is continuous at $x = 2$ if $a = 1$
- (B) $f(x)$ is continuous at $x = 2$ if $a = 4$
- (C) $f(x)$ is continuous at $x = 2$ if $a = 2$
- (D) $f(x)$ is continuous at $x = 2$ if $a = 0$

388. Evaluate : $\lim_{x \rightarrow 0} \frac{5e^{\frac{1}{x}}}{e^2 + e^x}$

- (A) Doesn't exist (B) 0
- (C) $\frac{5}{e}$ (D) None of these

Use the code: BVREDDY , to get maximum benefits

389. The value of $\lim_{x \rightarrow 2a} \frac{\sqrt{x-2a} + \sqrt{x} - \sqrt{2a}}{\sqrt{x^2 - 4a^2}}$

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

Use the code: BVREDDY , to get maximum benefits

390. The value $\lim_{x \rightarrow a} \frac{x - a}{|x - a|}$

- (A) 0
- (B) 1
- (C) -1
- (D) does not exist

Use the code: BVREDDY , to get maximum benefits

391. $\lim_{x \rightarrow 5} \frac{\sin^2(x-5) \tan(x-5)}{(x^2 - 25)(x-5)}$

- (A) 1 (B) $\frac{1}{10}$ (C) 0 (D) -6

Use the code: BVREDDY , to get maximum benefits

392. $\lim_{x \rightarrow 0} \frac{\tan x - \sin x}{x^3}$

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

Use the code: BVREDDY , to get maximum benefits

393. If $\lim_{x \rightarrow 0} \frac{x(1 + a \cos x) - b \sin x}{x^3} = 1$ then a and b
are

- (A) $\frac{1}{2}, \frac{-3}{2}$
- (B) $\frac{5}{2}, \frac{3}{2}$
- (C) $\frac{-5}{2}, \frac{-3}{2}$
- (D) $\frac{5}{2}, \frac{-3}{2}$

394.

$$\lim_{x \rightarrow \infty} \left(\frac{x+a}{x+b} \right)^{x+b}$$

- (A) 1 (B) e^{b-a} (C) e^{a-b} (D) e^b

Use the code: BVREDDY , to get maximum benefits

395. The function $f(x) = \frac{x \tan 2x}{\sin 3x \sin 5x}$ for $x \neq 0$
 $= k$ for $x=0$

is continuous at $x=0$ then $f(0)=\underline{\hspace{2cm}}$.

- (A) $\frac{2}{13}$ (B) $\frac{2}{17}$ (C) $\frac{2}{11}$ (D) $\frac{2}{15}$

396. $\lim_{x \rightarrow \infty} \left(\frac{3x - 4}{3x + 2} \right)^{\frac{x+1}{3}} =$

- (A) $e^{-\frac{2}{3}}$ (B) $e^{\frac{3}{2}}$ (C) $e^{\frac{2}{3}}$ (D) e

Use the code: BVREDDY , to get maximum benefits

397. If the function $f(x) = \frac{\sin^2 ax}{x^2}$ for $x \neq 0$
 $= 1$ for $x = 0$

is continuous at $x=0$ then $a = \underline{\hspace{2cm}}$.

- (A) ± 1 (B) 0 (C) $\pm \frac{1}{2}$ (D) $\pm \frac{1}{3}$

398. A function $f(x)$ is defined as

$$f(x) = ax - b; \quad x \leq 1$$

$$3x; \quad 1 < x < 2$$

$$bx^2 - a; \quad x \geq 2$$

is continuous at $x=1, 2$ then

(A) $a=5, b=2$ (B) $a=6, b=3$

(C) $a=7, b=4$ (D) $a=8, b=5$

Use the code: BVREDDY , to get maximum benefits

399.

Let $f(x) = x$ for $x < 1$

$= 2 - x$ for $1 \leq x \leq 2$

$= -2 + 3x - x^2$ for $x > 2$

then $f(x)$ is

- (A) differentiable at $x=1$,
- (B) differentiable at $x=2$
- (C) differentiable at $x=1$ and $x=2$
- (D) differentiable at $x=0$

400. $L_{t_5}(x - [x]) = \underline{\hspace{2cm}}$, where $[x]$ is a step function

- (a) $\frac{1}{4}$
- (b) $-\frac{1}{4}$
- (c) $\frac{1}{3}$
- (d) Doesn't exist

Use the code: BVREDDY , to get maximum benefits

401. $\lim_{x \rightarrow 2} \frac{|x - 2|}{x - 2} = \underline{\hspace{2cm}}$, where $|x - 2|$ is a modulus function.

- (a) 1
- (b) 2
- (c) -1
- (d) Doesn't exist

402. $\lim_{x \rightarrow 4} [x] = \underline{\hspace{2cm}}$, where $[x]$ is a step function

- (a) - 4
- (b) 4
- (c) 1
- (d) Doesn't exist

Use the code: BVREDDY , to get maximum benefits

403. $\lim_{x \rightarrow 0} \frac{x \sin(x)}{1 - \cos(x)} = \underline{\hspace{2cm}}$.

Use the code: BVREDDY , to get maximum benefits

404. $\lim_{x \rightarrow \frac{\pi}{2}} (\tan x - \sec x) = \underline{\hspace{2cm}}$.

Use the code: BVREDDY , to get maximum benefits

405.

$$\underset{x \rightarrow \infty}{\text{Lt}} (1+x^2)^{e^{-x}} = \underline{\hspace{2cm}}$$

- (a) 2 (b) 0 (c) 1 (d) -1

Use the code: BVREDDY , to get maximum benefits

406.

$$\lim_{x \rightarrow 0} x^x = \underline{\hspace{2cm}}$$

- (a) 0 (b) 1 (c) -1 (d) e

Use the code: BVREDDY , to get maximum benefits

407. $\lim_{x \rightarrow 0} \frac{\sqrt{a+x} - \sqrt{a-x}}{x} =$

(a) $\frac{1}{\sqrt{a}}$

(b) \sqrt{a}

(c) $\frac{1}{2\sqrt{a}}$

(d) $2\sqrt{a}$

Use the code: BVREDDY , to get maximum benefits

408. Which of the following is continuous at
 $x = 2$?

$$(a) f(x) = \begin{cases} 3 & , x = 2 \\ 2x - 1, & x > 2 \\ \frac{x+7}{3}, & x < 2 \end{cases}$$

$$(b) f(x) = \begin{cases} 2 & , x = 2 \\ 8-x, & x \neq 2 \end{cases}$$

$$(c) f(x) = \begin{cases} x+2, & x \leq 2 \\ x-4, & x > 2 \end{cases}$$

$$(d) f(x) = \frac{1}{x^3 - 8}, x \neq 2$$

Use the code: DVRCVDV1, to get maximum benefits

409.

Let $g(x) = \begin{cases} -x, & x \leq 1 \\ x+1 & x \geq 1 \end{cases}$ and

$$f(x) = \begin{cases} 1-x, & x \leq 0 \\ x^2, & x > 0 \end{cases}.$$

Consider the composition of f and g, i.e.

$$(f \circ g)(x) = f(g(x)).$$

The number of discontinuities in $(f \circ g)(x)$

present in the interval $(-\infty, 0)$ is

- | | |
|-------|-------|
| (a) 0 | (b) 1 |
| (c) 2 | (d) 4 |

Use the code: BVREDDY , to get maximum benefits

410.

$$\text{If } f(x) = \begin{cases} x & , \quad x \leq 1 \\ 2x - 1, & \text{when } x > 1 \end{cases}$$

then at $x = 1$ which of the following is true?

- (a) $f(x)$ is continuous but not differentiable
- (b) $f(x)$ is continuous and differentiable
- (c) $f(x)$ is neither continuous nor differentiable
- (d) $f(x)$ is differentiable but not continuous

Use the code: BVREDDY , to get maximum benefits

411. Let $f(x) = \begin{cases} x^2 & , \text{ if } x \leq 2 \\ mx + b, & \text{if } x > 2 \end{cases}$.

If $f(x)$ is differentiable every where then

- (a) $m = 4$ and $b = -4$
- (b) $m = 4$ and $b = 4$
- (c) $m = -4$ and $b = -4$
- (d) $m = -4$ and $b = 4$

412.

Which of the following functions is differentiable in the domain $[-1, 1]$?

- (a) $f(x) = |x|$
- (b) $f(x) = \cot x$
- (c) $f(x) = \sec x$
- (d) $f(x) = \operatorname{cosec} x$

Use the code: BVREDDY , to get maximum benefits

413. $\lim_{x \rightarrow 0} \frac{1 - \cos x}{x \sin x} =$

(a) 0

(b) 1

(c) $\frac{1}{2}$

(d) does not exist

Use the code: BVREDDY , to get maximum benefits

414. If $\lim_{x \rightarrow 0} \frac{\sin 2x + a \sin x}{x^3} = b$ where b is finite

value then find a and

- (a) $a = -2, b = -1$
- (b) $a = 2, b = -1$
- (c) $a = 0, b = 3$
- (d) $a = -2, b = 1$

Use the code: BVREDDY , to get maximum benefits

415.

$$\lim_{x \rightarrow 0} \frac{\log(\sin 2x)}{\log(\sin x)} = \underline{\hspace{2cm}}$$

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416. $\lim_{x \rightarrow a} (a - x) \tan\left(\frac{\pi x}{2a}\right) = \underline{\hspace{2cm}}$.

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417. $\lim_{x \rightarrow 0} x^{\sin x} =$ _____.

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418.

$$\lim_{x \rightarrow 0} \left(\frac{1}{x} \right)^{\tan x} = \underline{\hspace{2cm}}$$

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419. $\lim_{x \rightarrow \pi} \cot(x) =$

- (a) 0
- (b) 1
- (c) -1
- (d) does not exist

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420.

$\lim_{x \rightarrow a} [x] =$, where $[x]$ is step function and ‘a’

is an integer

- (a) a
- (b) $a - 1$
- (c) 0
- (d) does not exist

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421.

$$\lim_{x \rightarrow \infty} x \tan\left(\frac{1}{x}\right) = \underline{\hspace{2cm}}.$$

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422.

If $f(x) = (x + 1)^{\cot x}$ is continuous at $x = 0$

then $f(0) = \underline{\hspace{2cm}}$

(a) 0

(b) 1

(c) e

(d) none of these

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423.

Let $f(x) = \begin{cases} 0 & \text{for } x = 0 \\ \frac{1}{2} - x & \text{for } 0 < x < \frac{1}{2} \\ \frac{1}{2} & \text{for } x = \frac{1}{2} \\ \frac{3}{2} - x & \text{for } \frac{1}{2} < x < 1 \\ 1 & \text{for } x \geq 1 \end{cases}$

then which of the following is true?

(a) $f(x)$ is right continuous at $x = 0$

(b) $f(x)$ is discontinuous at $x = \frac{1}{2}$

(c) $f(x)$ is continuous at $x = 1$

(d) All are true

', to get maximum benefits

424. If $f(x) = 3 + x$ when $x \geq 0$

$$= 3 - x \text{ when } x < 0$$

then $f(x)$ at $x = 0$ is

- (a) continuous but not differentiable
- (b) continuous and differentiable
- (c) neither continuous nor differentiable
- (d) differentiable but not continuous

425. If $f(x) = x|x|$ then $f(x)$ at $x = 0$ is

- (a) continuous and differentiable
- (b) continuous but not differentiable
- (c) differentiable but not continuous
- (d) neither continuous nor differentiable

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426. The function $f(x) = |x+1|$ on the interval $[-2,0]$
is

- (a) continuous and differentiable
- (b) continuous on the interval but not differentiable
- (c) neither continuous nor differentiable
- (d) differentiable but not continuous

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427. The function

$$f(x) = \begin{cases} \frac{x e^{1/x}}{1 + e^{1/x}}, & x \neq 0 \\ 0, & x = 0 \end{cases}$$

- (a) differentiable but not continuous at $x = 0$
- (b) not differentiable at $x = 0$
- (c) differentiable and continuous at $x = 0$
- (d) not continuous at $x = 0$

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428. $\lim_{x \rightarrow 0} \sin\left(\frac{1}{x}\right) =$

- (a) ∞
- (b) 0
- (c) 1
- (d) does not exist

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429. $\lim_{x \rightarrow 0} x \cdot \sin\left(\frac{1}{x}\right) =$

- (a) 0
- (b) 1
- (c) ∞
- (d) does not exist

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430. $\lim_{x \rightarrow 2} \sqrt{4 - x^2} =$

- (a) 0
- (b) imaginary
- (c) does not exist
- (d) indeterminate

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431. $\lim_{x \rightarrow 0^+} \log x =$

- (a) ∞
- (b) $-\infty$
- (c) 0
- (d) does not exist

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432. If $\lim_{x \rightarrow 0} \left\{ \frac{x(1 + a \cos x) - b \sin x}{x^3} \right\} = 1$

then $(a, b) =$

- | | |
|-----------------|------------------|
| (a) $-5/2, 3/2$ | (b) $5/2, -3/2$ |
| (c) $5/2, 3/2$ | (d) $-5/2, -3/2$ |

433. $\lim_{x \rightarrow 0} \left(\frac{\log x}{\log \cosec x} \right) =$

- (a) 1
- (b) -1
- (c) 0
- (d) does not exist

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434. $\lim_{x \rightarrow \infty} \left(\frac{x^n}{e^x} \right) =$

- (a) 0
- (b) $n!$
- (c) 1
- (d) ∞

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435.

$$\lim_{x \rightarrow \infty} \left(\frac{\log x}{x^n} \right) =$$

(a) 0

(b) 1/n

(c) 1

(d) -1/n

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436. If $f(x) = \begin{cases} \sin^2(ax) / x^2, & x \neq 0 \\ 1, & x = 0 \end{cases}$

is continuous then $a =$

- (a) 0, 1
- (b) -1, 1
- (c) 0, -1
- (d) none of these

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437. If $f(x) = \begin{cases} 1 & \text{when } x < 0 \\ 1 + \sin x & \text{when } 0 \leq x \leq \pi/2 \\ 2 + (x - \pi/2)^2 & \text{when } x > \pi/2 \end{cases}$

then $f(x)$ is

- (a) continuous at $x = 0$ but discontinuous at $x = \pi/2$
- (b) continuous at $x = \pi/2$ but discontinuous at $x = 0$
- (c) continuous for all values of x
- (d) discontinuous at $x = 0$ and at $x = \pi/2$

438. If $f(x) = x^2 \sin\left(\frac{1}{x}\right)$ then which of the following is true?

- (a) $f'(0)$ exists but $f''(0)$ does not exist
- (b) both $f'(0)$ and $f''(0)$ does not exist
- (c) neither $f'(0)$ nor $f''(0)$ does not exist
- (d) $f'(0)$ does not exist but $f''(0)$ exists

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- 439.** If $f(x) = x \left(1 + \left(\frac{1}{3}\right) \sin(\log x)\right)$ then $f(x)$ is
- (a) continuous at $x = 0$ but not differentiable at $x = 0$
 - (b) differentiable at $x = 0$ but not continuous at $x = 0$
 - (c) continuous and differentiable at $x = 0$
 - (d) neither continuous nor differentiable at $x = 0$

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440. The function $f(x) = |x| + |x + 1| + |x - 2|$ is

differentiable at $x =$

- (a) 1
- (b) -1
- (c) 0
- (d) 2

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441. If $f(x) = 2 + x$ when $x \geq 0$

$$= 2 - x \text{ when } x < 0$$

then $f(x)$ at $x = 0$ is

- (a) continuous but not differentiable
- (b) continuous and differentiable
- (c) neither continuous nor differentiable
- (d) differentiable at $x = 0$ but not continuous

442.

$$\text{Let } f(x) = \begin{cases} x^2 \cdot \sin\left(\frac{1}{x}\right), & x \neq 0 \\ 0, & x = 0 \end{cases}$$

At $x = 0$, which of the following is *true* ?

- (a) $f(x)$ is continuous but not differentiable
- (b) $f(x)$ is differentiable and continuous
- (c) $f(x)$ is neither continuous nor
differentiable
- (d) $f(x)$ is differentiable but not continuous

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- 443.** If $f(x) = x \cdot |x|$ then at $x = 0$ which of the following statements is *true*?
- (a) $f(x)$ is continuous and differentiable
 - (b) $f(x)$ is not continuous and not differentiable
 - (c) $f(x)$ is continuous but not differentiable
 - (d) $f(x)$ is differentiable but not continuous

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444.

Let $f(x) = \begin{cases} x, & \text{if } x \text{ is rational} \\ -x, & \text{if } x \text{ is irrational} \end{cases}$

Which of the following is *true*?

- (a) $f(x)$ is continuous every where
- (b) $f(x)$ is discontinuous every where
- (c) $f(x)$ is discontinuous only at $x = 0$
- (d) $f(x)$ is continuous only at $x = 0$

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445. $\lim_{x \rightarrow 0} \frac{|x|}{x} = \underline{\hspace{2cm}}$, where $|x|$ is a modulus

function

- (a) 0
- (b) 1
- (c) -1
- (d) limit does not exist

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446. $\lim_{x \rightarrow 6} [x] = \underline{\hspace{2cm}}$, where $[x]$ is a step

function

- (a) -6
- (b) 5
- (c) 0
- (d) limit does not exist

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447.

$$\lim_{x \rightarrow 0} \frac{x - \sin x}{1 - \cos x} = \underline{\hspace{2cm}}.$$

(a) 0

(b) 4

(c) -3

(d) 1

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448.

$$\lim_{x \rightarrow \frac{\pi}{2}} \left(\sec x - \frac{1}{1 - \sin x} \right) = \text{_____}.$$

- (a) 0 (b) ∞ (c) -1 (d) 100

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449.

$$\underset{n \rightarrow \infty}{\text{Lt}} \left(7^n + 5^n\right)^{\frac{1}{n}} = \underline{\hspace{2cm}}.$$

(a) 7

(b) -7

(c) 5

(d) 0

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450. If $f(x) = \left(\frac{1-x}{x+1}\right)^{\frac{1}{x}}$ is continuous at $x = 0$

then $f(0) =$

- (a) e^{-2}
- (b) e^2
- (c) \sqrt{e}
- (d) $e^{-1/2}$

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451. Which one of the following functions is continuous at $x = 3$?

(a) $f(x) = \begin{cases} 5, & \text{if } x = 3 \\ 2x - 1, & \text{if } x > 3 \\ \frac{x+7}{2}, & \text{if } x < 3 \end{cases}$

(b) $f(x) = \begin{cases} 4, & \text{if } x = 3 \\ 8 - x & \text{if } x \neq 3 \end{cases}$

(c) $f(x) = \begin{cases} x + 3, & \text{if } x \leq 3 \\ x - 4 & \text{if } x > 3 \end{cases}$

(d) $f(x) = \frac{1}{x^3 - 27}, \quad \text{if } x \neq 3$

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452. Let f be a real-valued function of a real variable defined as

$$f(x) = x^2 \text{ for } x \geq 0, \text{ and } f(x) = -x^2 \text{ for } x < 0.$$

Which one of the following statements is true?

- (a) $f(x)$ is discontinuous at $x = 0$
- (b) $f(x)$ is continuous but not differentiable at $x = 0$
- (c) $f(x)$ is differentiable but its first derivative is not continuous at $x = 0$
- (d) $f(x)$ is differentiable but its first derivative is not differentiable at $x = 0$

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453. If $f(x) = \begin{cases} ax^2 + 1, & x \leq 1 \\ x^2 + ax + b, & x > 1 \end{cases}$ is differentiable

at $x = 1$ then

- (a) $a = 1, b = 1$
- (b) $a = 1, b = 0$
- (c) $a = 2, b = 0$
- (d) $a = 2, b = 1$

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