

Tarun Classes of Mathematics

IIT-JEE Mains | CBSE | PU-CET | NDA

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Continuity and Differentiability

Subjects : Maths

Practice Questions and Pyqs

Maths - Section A (MCQ.)

- The value of $f(0)$ so that the function $f(x) = \frac{(256 - 8x)^{\frac{1}{4}} - 4}{16 - 4(64 + 3x)^{\frac{1}{3}}}$, $x \neq 0$ is continuous at $x = 0$, is
A) $-\frac{1}{8}$ B) $\frac{1}{8}$ C) $\frac{1}{64}$ D) 8
- If the function f is continuous at $x = 1$, where $f(x) = \frac{1 + \cos(\pi x)}{\pi(1 - x)^2}$, for $x \neq 1$, then the value of $f(1)$ is....
A) $\frac{\pi}{2}$ B) $\frac{\pi}{4}$ C) $\frac{\pi}{6}$ D) $\frac{\pi}{9}$
- If $f(x)$ is continuous at $x = 0$, where $f(x) = \frac{8^x - 2^x}{k^x - 1}$, for $x \neq 0$ and $f(0) = 2$, then the value of k is ...
A) 0 B) 4 C) -2 D) 2
- If $f(x) = \begin{cases} \frac{(8 - 2x)^{\frac{1}{3}} - 2}{3 - (243 + 5x)^{\frac{1}{5}}}, & \text{if } x \neq 0 \\ k, & \text{if } x = 0 \end{cases}$ is continuous at $x = 0$, then $k =$
A) $\frac{5}{2}$ B) $-\frac{5}{2}$ C) $\frac{27}{2}$ D) $-\frac{27}{2}$
- The number of point / points where the function $f(x) = \frac{1}{x^2 - 5|x| + 6}$ is discontinuous is.....
A) 0 B) 1 C) 2 D) 4
- If $f(x)$ is continuous at point $x = 0$ where
$$f(x) = \begin{cases} \frac{3 \sin x + 5 \tan x}{a^{x-1}}, & x < 0 \\ \frac{2}{\log 2}, & x = 0 \\ \frac{8x + 2x \cos x}{b^{x-1}}, & x > 0 \end{cases}$$
then the values of a and b , respectively, are
A) 4,5 B) 16,32 C) 8,10 D) 16,16
- If $f(x) = \begin{cases} \frac{x-3}{|x-3|} + a, & x < 3 \\ a + b, & x = 3 \\ \left| \frac{x-3}{x-3} \right| + b, & x > 3 \end{cases}$
Is continuous at $x = 3$, then the value of $a - b$ is
A) -1 B) 0 C) 1 D) 2
- The number of discontinuities of the greatest integer function $f(x) = [x]$, $x \in (-\frac{7}{2}, 100)$

A) 104

B) 100

C) 102

D) 103

9. Let the function $f(x)$ be defined as:

$$f(x) = \begin{cases} \left[\tan \left(\frac{\pi}{4} + x \right) \right] \frac{1}{x}, & x \neq 0 \\ k, & x = 0 \end{cases}$$

If $f(x)$ is continuous at $x = 0$, then the value of k is...

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

10. If the function $f(x) = \frac{\log(1+ax) - \log(1-bx)}{x}$, $x \neq 0$ is continuous at $x = 0$ then, $f(0) = \underline{\hspace{2cm}}$

A) $\log a - \log b$ B) $a + b$ C) $\log a + \log b$ D) $a - b$

11. The function $f(x) = [x] \cdot \cos\left(\frac{2x-1}{2}\right)\pi$, where $[\cdot]$ denotes the greatest integer function, is discontinuous at

A) (A) all irrational numbers x .B) no x .

C) all integer points.

D) every rational x which is not an integer.

12. If the function $f(x) = \frac{1 - \sin 2x + \cos 2x}{1 + \sin 2x + \cos 2x}$ if $x \neq \frac{\pi}{2}$
 $= k$ if $x = \frac{\pi}{2}$
 is continuous at $x = \frac{\pi}{2}$, then $k =$

A) 2

B) 1

C) 0

D) -1

13. If the function $f(x)$ defined by $f(x) = \begin{cases} x \sin \frac{1}{x} & \text{for } x \neq 0 \\ k & \text{for } x = 0 \end{cases}$ is continuous at $x = 0$, then $k = \underline{\hspace{2cm}}$

A) 0

B) 1

C) -1

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

14. The set of points where the function $f(x) = |x-1|e^x$ is differentiable, is

A) R B) $R - \{1\}$ C) $R - \{-1\}$ D) $R - \{0\}$

15. If $f(x) = \begin{cases} \frac{\log(1+2ax) - \log(1-bx)}{x}, & x \neq 0 \\ k, & x = 0 \end{cases}$
 continuous at $x = 0$, then value of k is

A) $b + a$ B) $b - 2a$ C) $2a - b$ D) $2a + b$

16. If $f(x) = \frac{x + x^2 + x^3 + \dots + x^n - n}{x-1}$, for $x \neq 1$ is continuous at $x = 1$, then $f(1) =$

A) $\frac{n(n+1)(4n-1)}{6}$ B) $\frac{n(n+1)}{2}$ C) $\frac{n(n+1)(2n+1)}{6}$ D) $\frac{n(2n+1)}{4}$

17. Let $f(x) = x \left[\frac{x}{2} \right]$, for $-10 < x < 10$, where $[t]$ denotes the greatest integer function. Then the number of points of discontinuity of f is equal to

A) 10

B) 9

C) 6

D) 8

18. If the derivative of the function $f(x) = \begin{cases} ax^2 + b & \text{if } x < -1 \\ bx^2 + ax + 4 & \text{if } x \geq -1 \end{cases}$ is continuous everywhere then

A) $a = 2, b = 3$ B) $a = 3, b = 2$ C) $a = -2, b = 3$ D) $a = -3, b = -2$

19. If the function f is continuous at $x = \pi$, where $f(x) = \frac{1 - \cos[7(x - \pi)]}{5(x - \pi)^2}$, for $x \neq \pi$, then $f(\pi) =$

A) $\frac{49}{4}$ B) $\frac{4}{49}$ C) $\frac{49}{10}$ D) $\frac{10}{49}$

20. The function $f(x) = e^{-|x|}$ is

- A) continuous everywhere but not differentiable at $x = 0$
- B) continuous and differentiable everywhere
- C) not continuous at $x = 0$
- D) None of the above
21. If $f : R \rightarrow R$ is an even function then
- A) $f'(0) = 1$
- B) $f'(x)$ is an even function
- C) $f(0) = 0$
- D) $f'(x)$ is an odd function
22. If $y = \frac{1}{3x+5}$, then the value of $\frac{d^9 y}{dx^9}$ is..
- A) $\frac{9! \times 3^9}{(3x+5)^9}$
- B) $\frac{(-1)^8 \times 9! \times 3^9}{(3x+5)^9}$
- C) $\frac{(-1)^9 \times 9! \times 3^9}{(3x+5)^{10}}$
- D) $\frac{(-1)^8 \times 8! \times 3^9}{(3x+5)^{10}}$
23. If $y = \cos^{-1}(\sin x)$, where $\frac{\pi}{2} < x < \pi$, then $\frac{dy}{dx} = \dots$
- A) -1
- B) 0
- C) 1
- D) 2
24. The derivative of $\tan^{-1}\left(\frac{\sqrt{1+x^2}-1}{x}\right)$ with respect to $\sin^{-1}\left(\frac{2x}{1+x^2}\right)$ is...
- A) $\frac{1}{2}$
- B) $\frac{1}{4}$
- C) 1
- D) 2
25. If $\cot[f(x)] = \frac{3x-x^3}{1-3x^2}$ and $\sin[g(x)] = \frac{1-x^2}{1+x^2}$, then $\lim_{x \rightarrow t} \frac{f(x)-f(t)}{g(x)-g(t)} = \dots$
- A) $\frac{3}{2(1+t^2)}$
- B) $\frac{3}{2}$
- C) $\frac{5}{2}$
- D) $-\frac{5}{2(1+t^2)}$
26. The derivative of $\log_{10} x$ with respect to $\log_x 10$ is
- A) $-\log_{10} x^2$
- B) $-(\log_{10} x)^2$
- C) $(\log_x 10)^2$
- D) $\frac{x^2}{100}$
27. If $y = [(x+1)(2x+1)(3x+1) \dots (nx+1)]^4$, where $n \in N$ and $\frac{dy}{dx}$ at $x = 0$ is $2k$, then the value of k is
- A) $\frac{n(n+1)}{2}$
- B) $n(n+1)$
- C) $2n(n+1)$
- D) $4n(n+1)$
28. If $x = \sin(t)$, $y = \cos(pt)$, then $(1-x^2)\frac{d^2 y}{dx^2} - x\frac{dy}{dx} =$
- A) 0
- B) $-p^2 y$
- C) $p^2 y$
- D) p
29. If $y = \sqrt{\tan x + \sqrt{\tan x + \sqrt{\tan x + \dots \infty}}}$, then $\left(\frac{dy}{dx}\right)^2$ at $x = \frac{\pi}{4}$ is
- A) $\frac{5}{4}$
- B) $\frac{-5}{4}$
- C) $\frac{4}{5}$
- D) $\frac{-4}{5}$

30. If $x^3 + y^3 = 6$ and $\frac{d^2y}{dx^2} \cdot \frac{d^2x}{dy^2} = \frac{m}{(xy)^n}$, where $m, n \in R$ then $\frac{m}{n} =$
- A) 36 B) 9 C) 6 D) 4
31. If $y^{\frac{1}{m}} + y^{\frac{-1}{m}} = 2x$, then $(x^2 - 1)y_1^2 =$
- A) my^2 B) m^2y^2 C) m^2y D) my
32. If $y = \sin(e^{\log 2x})$, then the value of $\frac{dy}{dx}$ at $x = \frac{\pi}{2}$ is
- A) 2 B) -2 C) 1 D) -1
33. If $f(x) = \sqrt{x^2 + 1}$, $g(x) = \frac{x+1}{x^2+1}$, $h(x) = 2x - 3$, then $f'(h'(g'(x))) =$
- A) 0 B) $\frac{1}{\sqrt{x^2+1}}$ C) $\frac{2}{\sqrt{5}}$ D) $\frac{x}{\sqrt{x^2+1}}$
34. If $y = \log x^x$, then the value of $\left(\frac{dy}{dx}\right)^2$ at $x = e^2$ is
- A) 4 B) e C) e^2 D) 9
35. The derivative of $\log_8(\log_5 x)$ w. r. t. x is
- A) $\frac{1}{\log_5 8 \log x}$ B) $\frac{1}{x \log 5 \log x}$ C) $\frac{1}{x \log x \log 8 \log 5}$ D) $\frac{1}{x \log 8 \log x}$
36. The derivative of the function $f(x) = \cos^4 x + \sin^4 x$, $0 \leq x \leq 2\pi$ is positive for
- A) $0 < x < \frac{\pi}{8}$ B) $\frac{\pi}{4} < x < \frac{\pi}{2}$ C) $\frac{\pi}{2} < x < \frac{5\pi}{8}$ D) $\frac{5\pi}{8} < x < \frac{3\pi}{4}$
37. If $f(x) = \cos x \cos 2x \cos 4x \cos 8x \cos 16x$, then $f'\left(\frac{\pi}{4}\right)$ is equal to
- A) 1 B) 0 C) $\sqrt{2}$ D) $\frac{1}{\sqrt{2}}$
38. If $8f(x) + 6f\left(\frac{1}{x}\right) = x + 5$ and $y = x^2 f(x)$, then $\frac{dy}{dx}$ at $x = -1$ is
- A) 14 B) -14 C) $\frac{1}{14}$ D) $-\frac{1}{14}$
39. If $f(1) = 3$, $f'(1) = 2$, then $\frac{d}{dx} \{\log [f(e^x + 2x)]\}$ at $x = 0$ is
- A) $\frac{2}{3}$ B) $\frac{3}{2}$ C) 2 D) 0
40. If $(a + bx)e^{\frac{y}{x}} = x$, then $x^3 \frac{d^2y}{dx^2}$ is equal to
- A) $\left(y \frac{dy}{dx} - x\right)^2$ B) $\left(x \frac{dy}{dx} - y\right)^2$ C) $\left(x \frac{dy}{dx} + y\right)^2$ D) $\left(y \frac{dy}{dx} + x\right)^2$
41. If $x = \sin \theta$, $y = \sin^3 \theta$, then $\frac{d^2y}{dx^2}$ at $\theta = \frac{\pi}{2}$ is
- A) 0 B) 2 C) 3 D) 6
42. If $f(x) = (1+x)(1+x^2)(1+x^4)(1+x^8)$, then $f'(1) =$
- A) 60 B) 80 C) 240 D) 120
43. If $y = \log \left[e^{5x} \left(\frac{3x-4}{x+5} \right)^{\frac{4}{3}} \right]$, then $\frac{dy}{dx}$ is equal to
- A) $5 + \frac{4}{3x-4} - \frac{4}{3(x+5)}$ B) $5 + \frac{4}{3(3x-4)} - \frac{4}{3(x+5)}$
- C) $5x + \frac{4}{3x-4} - \frac{4}{3(x+5)}$ D) $5 + \frac{12}{3x-4} - \frac{4}{(x+5)}$

44. If $f(x) = \sin^{-1}\left(\frac{2 \cdot 3^x}{1+9^x}\right)$, then $f'\left(\frac{1}{2}\right)$ equals
- A) $\sqrt{3} \log(\sqrt{3})$ B) $-\sqrt{3} \log 3$ C) $-\sqrt{3} \log(\sqrt{3})$ D) $\sqrt{3} \log 3$
45. If $x^2 + y^2 = t + \frac{1}{t}$ and $x^4 + y^4 = t^2 + \frac{1}{t^2}$, then $\frac{dy}{dx}$ is equal to
- A) $\frac{y}{x}$ B) $\frac{-y}{x}$ C) $\frac{x}{y}$ D) $\frac{-x}{y}$
46. If $e^x + e^y = e^{x+y}$, then $\frac{dy}{dx} =$
- A) $-e^{y-x}$ B) e^{x-y} C) $-e^{x-y}$ D) e^{y-x}
47. If $y = \sin^{-1}\left(\frac{5x+12\sqrt{1-x^2}}{13}\right)$, then $\frac{dy}{dx} =$
- A) $\frac{2}{\sqrt{1-x^2}}$ B) $\frac{x}{\sqrt{1-x^2}}$ C) $\frac{-1}{\sqrt{1-x^2}}$ D) $\frac{-x}{\sqrt{1-x^2}}$
48. If $x = \sqrt{a^{\sin^{-1}t}}$, $y = \sqrt{a^{\cos^{-1}t}}$, then $\frac{dy}{dx} = \dots\dots\dots$
- A) $\frac{-y}{x}$ B) $\frac{x}{y}$ C) $\frac{y}{x}$ D) $\frac{-x}{y}$
49. If $y = 3e^{5x} + 5e^{3x}$, then $\frac{d^2y}{dx^2} - 8\frac{dy}{dx} =$
- A) $-10y$ B) $15y$ C) $-15y$ D) $10y$
50. If $y\sqrt{1-x^2} + x\sqrt{1-y^2} = 1$, then $\frac{dy}{dx} =$
- A) $-\sqrt{\frac{1-y^2}{1-x^2}}$ B) $-\sqrt{\frac{1-x^2}{1-y^2}}$ C) $\sqrt{\frac{1+y^2}{1+x^2}}$ D) $\sqrt{\frac{1-x^2}{1-y^2}}$
51. If $y = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \dots\dots$ then $\frac{dy}{dx} =$
- A) $y - 1$ B) $y + 1$ C) $y^2 - 1$ D) y
52. If $f(x) = |x - 3|$, then $f'(3)$ is
- A) -1 B) 1 C) 0 D) does not exist
53. If $x^p + y^q = (x + y)^{p+q}$, then $\frac{dy}{dx}$ is
- A) $-\frac{x}{y}$ B) $\frac{x}{y}$ C) $-\frac{y}{x}$ D) $\frac{y}{x}$
54. If $x = 2 \cos t - \cos 2t$, $y = 2 \sin t - \sin 2t$, then the value of $\left.\frac{d^2y}{dx^2}\right|_{t=\pi/2}$ is
- A) $3/2$ B) $5/2$ C) $5/2$ D) $-3/2$
55. If $x^p y^q = (x + y)^{p+q}$, then $\frac{dy}{dx}$ is equal to
- A) y/x B) py/qx C) x/y D) qy/px

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Practice Questions and Pyqs

Maths - Section A (MCQ.)

1 - B	2 - A	3 - D	4 - C	5 - D	6 - B	7 - D	8 - D	9 - B	10 - B
11 - C	12 - D	13 - A	14 - B	15 - D	16 - B	17 - D	18 - A	19 - C	20 - A
21 - D	22 - C	23 - C	24 - B	25 - B	26 - B	27 - B	28 - B	29 - C	30 - A
31 - B	32 - B	33 - C	34 - D	35 - D	36 - B	37 - C	38 - D	39 - C	40 - B
41 - D	42 - D	43 - A	44 - A	45 - B	46 - A	47 - C	48 - A	49 - C	50 - A
51 - D	52 - D	53 - D	54 - D	55 - A					