



GRADE 12TH MATHS
CHAPTER 5

Continuity and Differentiability

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OBJECTIVE TYPE QUESTIONS (1 MARK)

- The function $f(x) = \begin{cases} \frac{\sin x}{x} + \cos x, & \text{if } x \neq 0 \\ k & , \text{if } x = 0 \end{cases}$ is continuous at $x = 0$, then the value of k is
(a) 3 (b) 2 (c) 1 (d) 1.5
- The function $f(x) = [x]$, where $[x]$ denotes the greatest integer function, is continuous at
(a) 4 (b) -2 (c) 1 (d) 1.5
- The number of points at which the function $f(x) = \frac{1}{x - [x]}$ is not continuous is
(a) 1 (b) 2 (c) 3 (d) none of these
- The function given by $f(x) = \tan x$ is discontinuous on the set
(a) $\{n\pi : n \in \mathbb{Z}\}$ (b) $\{2n\pi : n \in \mathbb{Z}\}$ (c) $\left\{(2n+1)\frac{\pi}{2} : n \in \mathbb{Z}\right\}$ (d) $\left\{\frac{n\pi}{2} : n \in \mathbb{Z}\right\}$
- Let $f(x) = |\cos x|$. Then,
(a) f is everywhere differentiable.
(b) f is everywhere continuous but not differentiable at $x = n\pi, n \in \mathbb{Z}$.
(c) f is everywhere continuous but not differentiable at $x = (2n+1)\frac{\pi}{2}$.
(d) none of these.
- The function $f(x) = |x| + |x-1|$ is
(a) continuous at $x = 0$ as well as at $x = 1$. (b) continuous at $x = 1$ but not at $x = 0$.
(c) discontinuous at $x = 0$ as well as at $x = 1$. (d) continuous at $x = 0$ but not at $x = 1$.
- The value of k which makes the function defined by $f(x) = \begin{cases} \sin \frac{1}{x}, & \text{if } x \neq 0 \\ k & , \text{if } x = 0 \end{cases}$, continuous at $x = 0$ is
(a) 8 (b) 1 (c) -1 (d) none of these
- The set of points where the functions f given by $f(x) = |x-3| \cos x$ is differentiable is
(a) \mathbb{R} (b) $\mathbb{R} - \{3\}$ (c) $(0, \infty)$ (d) none of these
- Differential coefficient of $\sec(\tan^{-1}x)$ w.r.t. x is
(a) $\frac{x}{\sqrt{1+x^2}}$ (b) $\frac{x}{1+x^2}$ (c) $x\sqrt{1+x^2}$ (d) $\frac{1}{\sqrt{1+x^2}}$
- If $u = \sin^{-1}\left(\frac{2x}{1+x^2}\right)$ and $v = \tan^{-1}\left(\frac{2x}{1-x^2}\right)$, then $\frac{du}{dv}$ is
(a) $\frac{1}{2}$ (b) x (c) $\frac{1-x^2}{1+x^2}$ (d) 1
- A function f is said to be continuous for $x \in \mathbb{R}$, if
(a) it is continuous at $x = 0$ (b) differentiable at $x = 0$
(c) continuous at two points (d) differentiable for $x \in \mathbb{R}$

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12. If $f(x) = \frac{\sin(e^{x-2}) - 1}{\log(x-1)}$, $x \neq 2$ and $f(x) = k$ for $x = 2$, then value of k for which f is continuous is
(a) -2 (b) -1 (c) 0 (d) 1

13. If $f(x) = 2x$ and $g(x) = \frac{x^2}{2} + 1$, then which of the following can be a discontinuous function
(a) $f(x) + g(x)$ (b) $f(x) - g(x)$ (c) $f(x) \cdot g(x)$ (d) $\frac{g(x)}{f(x)}$

14. The function $f(x) = \frac{1-x^2}{4x-x^3}$ is
(a) discontinuous at only one point (b) discontinuous at exactly two points
(c) discontinuous at exactly three points (d) none of these

15. The set of points where the function f given by $f(x) = |2x-1| \sin x$ is differentiable is
(a) \mathbb{R} (b) $\mathbb{R} - \left\{\frac{1}{2}\right\}$ (c) $(0, \infty)$ (d) none of these

16. The function $f(x) = \cot x$ is discontinuous on the set
(a) $\{n\pi : n \in \mathbb{Z}\}$ (b) $\{2n\pi : n \in \mathbb{Z}\}$ (c) $\left\{(2n+1)\frac{\pi}{2} : n \in \mathbb{Z}\right\}$ (d) $\left\{\frac{n\pi}{2} : n \in \mathbb{Z}\right\}$

17. Let $f(x) = |\sin x|$. Then,
(a) f is everywhere differentiable.
(b) f is everywhere continuous but not differentiable at $x = n\pi$, $n \in \mathbb{Z}$.
(c) f is everywhere continuous but not differentiable at $x = (2n+1)\frac{\pi}{2}$, $n \in \mathbb{Z}$.
(d) none of these.

18. 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 these.

19. If $f(x) = x^2 \sin \frac{1}{x}$, where $x \neq 0$, then the value of the function f at $x = 0$, so that the function is continuous at $x = 0$, is
(a) 0 (b) -1 (c) 1 (d) none of these

20. If $f(x) = \begin{cases} mx+1, & \text{if } x \leq \frac{\pi}{2} \\ \sin x + n, & \text{if } x > \frac{\pi}{2} \end{cases}$, is continuous at $x = \frac{\pi}{2}$, then
(a) $m = 1, n = 0$ (b) $m = \frac{n\pi}{2} + 1$ (c) $n = \frac{m\pi}{2}$ (d) $m = n = \frac{\pi}{2}$

21. If $y = \log\left(\frac{1-x^2}{1+x^2}\right)$, then $\frac{dy}{dx}$ is equal to _____.

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- (a) $\frac{4x^3}{1-x^4}$ (b) $\frac{-4x}{1-x^4}$ (c) $\frac{1}{4-x^4}$ (d) $\frac{-4x^3}{1-x^4}$
22. If $y = \sqrt{\sin x + y}$, then $\frac{dy}{dx}$ is equal to _____.
- (a) $\frac{\cos x}{2y-1}$ (b) $\frac{\cos x}{1-2y}$ (c) $\frac{\sin x}{2y-1}$ (d) $\frac{\sin x}{1-2y}$
23. The derivative of $\cos^{-1}(2x^2 - 1)$ w.r.t. $\cos^{-1}x$ is
- (a) 2 (b) $\frac{-1}{2\sqrt{1-x^2}}$ (c) $\frac{2}{x}$ (d) $1 - x^2$
24. If $x = t^2$, $y = t^3$, then $\frac{d^2y}{dx^2}$ is
- (a) $\frac{3}{2}$ (b) $\frac{3}{4t}$ (c) $\frac{3}{2t}$ (d) $\frac{3}{4}$
25. If the function $f(x) = \begin{cases} \frac{k \cos x}{\pi - 2x}, & \text{if } x \neq \frac{\pi}{2} \\ 3 & \text{if } x = \frac{\pi}{2} \end{cases}$ be continuous at $x = \frac{\pi}{2}$, then $k =$
- (a) 3 (b) 6 (c) 12 (d) none of these
26. In order that the function $f(x) = (x + 1)^{1/x}$ is continuous at $x = 0$, $f(0)$ must be defined as
- (a) $f(0) = 0$ (b) $f(0) = e$ (c) $f(0) = 1/e$ (d) $f(0) = 1$
27. Let $f(x) = \begin{cases} x^2 + k, & \text{if } x \geq 0 \\ -x^2 - k, & \text{if } x < 0 \end{cases}$. If the function $f(x)$ be continuous at $x = 0$, then $k =$
- (a) 0 (b) 1 (c) 2 (d) -2
28. The points at which the function $f(x) = \frac{x+1}{x^2+x-12}$ is discontinuous are
- (a) -3, 4 (b) 3, -4 (c) -1, -3, 4 (d) -1, 3, 4
29. If $f(x) = |x - b|$, then function
- (a) Is continuous at $x = 1$ (b) Is continuous at $x = b$
(c) Is discontinuous at $x = b$ (d) None of these
30. If $f(x) = \begin{cases} 1+x, & \text{if } x \leq 2 \\ 5-x, & \text{if } x > 2 \end{cases}$, then
- (a) $f(x)$ is continuous at $x = 2$ (b) $f(x)$ is discontinuous at $x = 2$
(c) $f(x)$ is continuous at $x = 3$ (d) None of these
31. If function $f(x) = \begin{cases} \frac{x^2-1}{x-1}, & \text{if } x \neq 1 \\ k, & \text{if } x = 1 \end{cases}$ is continuous at $x = 1$, then the value of k will be
- (a) -1 (b) 2 (c) -3 (d) -2

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32. For the function $f(x) = \begin{cases} \frac{\sin^2 ax}{x^2}, & \text{if } x \neq 0 \\ 1, & \text{if } x = 0 \end{cases}$ which one is a true statement
- (a) $f(x)$ is continuous at $x = 0$ (b) $f(x)$ is discontinuous at $x = 0$, when $a \neq \pm 1$
(c) $f(x)$ is continuous at $x = a$ (d) None of these
33. If $f(x) = \begin{cases} \frac{\sin 2x}{5x}, & \text{if } x \neq 0 \\ k, & \text{if } x = 0 \end{cases}$ is continuous at $x = 0$, then the value of k will be
- (a) 1 (b) $\frac{2}{5}$ (c) $-\frac{2}{5}$ (d) None of these
34. If $f(x) = \begin{cases} \frac{|x-a|}{x-a}, & \text{if } x \neq a \\ 1, & \text{if } x = a \end{cases}$, then
- (a) $f(x)$ is continuous at $x = a$ (b) $f(x)$ is discontinuous at $x = a$
(c) $\lim_{x \rightarrow a} f(x) = 1$ (d) None of these
35. If $f(x) = \begin{cases} \frac{x^4 - 16}{x - 2}, & \text{if } x \neq 2 \\ 16, & \text{if } x = 2 \end{cases}$, then
- (a) $f(x)$ is continuous at $x = 2$ (b) $f(x)$ is discontinuous at $x = 2$
(c) $\lim_{x \rightarrow 2} f(x) = 16$ (d) None of these
36. The number of points at which the function $f(x) = \frac{1}{\log|x|}$ is discontinuous is _____.
37. If $f(x) = \begin{cases} ax + 1, & \text{if } x \geq 1 \\ x + 2, & \text{if } x < 1 \end{cases}$ is continuous, then a should be equal to _____.
38. The derivative of $\log_{10} x$ w.r.t. x is _____.
39. If $y = \sec^{-1}\left(\frac{\sqrt{x}+1}{\sqrt{x}-1}\right) + \sin^{-1}\left(\frac{\sqrt{x}-1}{\sqrt{x}+1}\right)$, then $\frac{dy}{dx}$ is equal to _____.
40. The derivative of $\sin x$ w.r.t. $\cos x$ is _____.
41. The function $f(x) = \frac{x+1}{1+\sqrt{1+x}}$ is continuous at $x = 0$ if $f(0)$ is _____.
42. An example of a function which is continuous everywhere but fails to be differentiable exactly at two points is _____.
43. Derivative of x^2 w.r.t. x^3 is _____.
44. If $f(x) = |\cos x|$, then $f'\left(\frac{\pi}{4}\right) =$ _____.
45. If $f(x) = |\cos x - \sin x|$, then $f'\left(\frac{\pi}{3}\right) =$ _____.
46. For the curve $\sqrt{x} + \sqrt{y} = 1$, $\frac{dy}{dx}$ at $\left(\frac{1}{4}, \frac{1}{4}\right)$ is _____.