

Topic :-LIMITS AND DERIVATIVES

- If $f'(2) = 2$, $f''(2) = 1$, then $\lim_{x \rightarrow 2} \frac{2x^2 - 4f'(x)}{x-2}$, is
a) 4 b) 0 c) 2 d) ∞
- $\lim_{x \rightarrow \pi/4} \frac{\int_2^{\sec^2 x} f(t) dt}{x^2 - \pi^2/16}$ equals
a) $\frac{8}{\pi}f(2)$ b) $\frac{2}{\pi}f(2)$ c) $\frac{2}{\pi}f(\frac{1}{2})$ d) $4f(2)$
- If $f(a) = 2$, $f'(a) = 1$, $g(a) = 3$, $g'(a) = -1$, then $\lim_{x \rightarrow a} \frac{f(a)g(x) - f(x)g(a)}{x-a}$ is equal to
a) 6 b) 1 c) -1 d) -5
- If $f(x) = \left(\frac{x^2 + 5x + 3}{x^2 + x + 2}\right)^x$ then $\lim_{x \rightarrow \infty} f(x)$ is equal to
a) e^4 b) e^3 c) e^2 d) 24
- $\lim_{x \rightarrow 0} \frac{\sin^{-1} x - x}{x^3 \cos x}$ is equal to
a) $1/2$ b) $1/3$ c) $1/6$ d) $1/12$
- For $x > 0$, $\lim_{x \rightarrow 0} \left((\sin x)^{1/x} + \left(\frac{1}{x}\right)^{\sin x} \right)$ is
a) 0 b) -1 c) 1 d) 2
- The value of $\lim_{x \rightarrow \infty} \left(\frac{3x-4}{3x+2}\right)^{\frac{x+1}{3}}$ is equal to
a) $e^{-1/3}$ b) $e^{-2/3}$ c) e^{-1} d) e^{-2}
- $\lim_{x \rightarrow 0} \frac{1}{x} \sin^{-1} \left(\frac{2x}{1+x^2}\right)$ is equal to
a) -2 b) 0 c) 2 d) ∞
- $\lim_{x \rightarrow 0} \frac{2 \sin^2 3x}{x^2}$ is equal to
a) 0 b) 1 c) 18 d) 36
- $\lim_{x \rightarrow 0} \frac{a^x + a^{-x} - 2}{x^2}$ is equal to

- a) $(\log a)^2$ b) $\log a$ c) 0 d) None of these

11. Let $f(x) = \begin{cases} 1, & \text{when } x \text{ is rational} \\ 0, & \text{when } x \text{ is irrational} \end{cases}$, then $\lim_{x \rightarrow 0} f(x)$ is

- a) 0 b) 1 c) $\frac{1}{2}$ d) None of these

12. For $x \in R$ $\lim_{x \rightarrow \infty} \left(\frac{x-3}{x+2}\right)^x$ is equal to

- a) e b) e^{-1} c) e^{-5} d) e^5

13. The value of $\lim_{x \rightarrow \infty} x \cos\left(\frac{\pi}{4x}\right) \sin\left(\frac{\pi}{4x}\right)$, is

- a) $\frac{\pi}{2}$ b) $\frac{\pi}{4}$ c) 1 d) None of these

14. The derivative of function $f(x)$ is $\tan^4 x$. If $f(x) = 0$, then $\lim_{x \rightarrow 0} \frac{f(x)}{x}$ is equal to

- a) 1 b) 0 c) -1 d) None of these

15. Let $f(x) = \begin{cases} (1/2)\{g(x) + (x)\}\sin(x), & x \geq 1 \\ \sin x/x, & x < 1 \end{cases}$

Where $g(x) = \begin{cases} 1, & \text{if } x > 0 \\ -1, & \text{if } x < 0 \\ 0, & \text{if } x = 0 \end{cases}$ Then, $\lim_{x \rightarrow 1} f(x)$ is equal to

- a) 0 b) 2 c) $\sin 1$ d) None of these

16. If $\lim_{x \rightarrow \infty} \left[\frac{x^3 + 1}{x^2 + 1} - (ax + b) \right] = 2$, then

- a) $a = 1$ and $b = 1$ b) $a = 1$ and $b = -1$ c) $a = 1$ and $b = -2$ d) $a = 1$ and $b = 2$

17. If $f: R \rightarrow R$ is defined by

$$f(x) = \begin{cases} \frac{x-2}{x^2-3x+2}, & \text{if } x \in R - \{1, 2\} \\ 2, & \text{if } x = 1 \\ 1, & \text{if } x = 2 \end{cases}$$

Then $\lim_{x \rightarrow 2} \frac{f(x) - f(2)}{x - 2}$ is equal to

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

18. Let $f: R \rightarrow R$ be a differentiable function such that $f(3) = 3$, $f'(3) = \frac{1}{2}$. Then, the value of

$$\lim_{x \rightarrow 3} \frac{\int_3^{f(x)} 2t^3 dt}{x - 3}$$
 is

- a) 25 b) 26 c) 27 d) None of these

19. Let $f(a) = g(a) = k$ and their n th derivatives $f^n(a)$, $g^n(a)$ exist and are not equal for some n . Further if

$$\lim_{x \rightarrow a} \frac{f(a)g(x) - f(x)g(a) - g(a)f(x) + g(a)^2}{g(x) - f(x)} = 4$$
, then the value of k is equal to

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

20. The value of $\lim_{x \rightarrow 0} \frac{\sin x}{\sqrt{x^2}}$, is

a) 1

b) -1

c) 0

d) None of these

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