

Topic :-DIFFERENTIATION

1. If $f(x) = \sqrt{x^2 - 2x + 1}$, then
 - a) $f'(x) = 1$ for all x
 - b) $f'(x) = -1$ for all $x \leq 1$
 - c) $f'(x) = 1$ for all $x \geq 1$
 - d) None of these

2. If $u = \sin^{-1}\left(\frac{x}{y}\right) + \tan^{-1}\left(\frac{y}{x}\right)$, then the value of $x \frac{\partial u}{\partial x} + y \frac{\partial u}{\partial y}$ is
 - a) 0
 - b) 1
 - c) 2
 - d) None of these

3. If $u(x,y) = y \log x + x \log y$, then $u_x u_y - u_x \log x - u_y \log y + \log x \log y$ is equal to
 - a) 0
 - b) -1
 - c) 1
 - d) 2

4. If $x = A \cos 4t + B \sin 4t$, then $\frac{d^2 x}{dt^2}$ is equal to
 - a) $-16x$
 - b) $16x$
 - c) x
 - d) $-x$

5. If $f(x)$ has a derivative at $x = a$, then $\lim_{x \rightarrow a} \frac{xf(a) - af(x)}{x-a}$ is equal to
 - a) $f(a) - af'(a)$
 - b) $af(a) - f'(a)$
 - c) $f(a) + f'(a)$
 - d) $af(a) + f'(a)$

6. $\frac{d}{dx}[x^x + x^a + a^x + a^a] = \dots, a$ is constant
 - a) $x^x(1 + \log x) + a.x^{a-1}$
 - b) $x^x(1 + \log x) + a.x^{a-1} + a^x \log a$
 - c) $x^x(1 + \log x) + a^a (1 + \log a)$
 - d) $x^x(1 + \log x) + a^a(1 + \log a) + ax^{a-1} + a^a(1 + \log a)$

7. If $y = a^x \cdot b^{2x-1}$, then $\frac{d^2 y}{dx^2}$ is
 - a) $y^2 \log ab^2$
 - b) $y \log ab^2$
 - c) y^2
 - d) $y(\log ab^2)^2$

8. If $f(x) = x + 2$, then the value of $f'[f(x)]$ at $x = 4$ is
 - a) 8
 - b) 1
 - c) 4
 - d) 5

9. If $ax^2 + 2hxy + by^2 = 1$, then $\frac{d^2 y}{dx^2}$ equals

a) $\frac{h^2 + ab}{(hx + by)^3}$

b) $\frac{h^2 - ab}{(hx + by)^2}$

c) $\frac{h^2 + ab}{(hx + by)^3}$

d) $\frac{h^2 - ab}{(hx + by)^3}$

10. Let $f(x) = \sin x, g(x) = x^2$ and $h(x) = \log_e x$. If $F(x) = (hogof)(x)$, then $F''(x)$ is equal to

a) $a \operatorname{cosec}^3 x$

b) $2 \cot x^2 - 4x^2 \operatorname{cosec}^2 x^2$

c) $2x \cot x^2$

d) $-2 \operatorname{cosec}^2 x$

11. If $\sin^{-1} x + \sin^{-1} y = \frac{\pi}{2}$, then $\frac{dy}{dx}$ is equal to

a) $\frac{x}{y}$

b) $-\frac{x}{y}$

c) $\frac{y}{x}$

d) $-\frac{y}{x}$

12. If $y = \tan^{-1}(\sec x - \tan x)$, then $\frac{dy}{dx}$ is

a) 2

b) -2

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

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

13. If $x = e^t \sin t, y = e^t \cos t$, then $\frac{d^2y}{dx^2}$ at $x = \pi$, is

a) $2e^\pi$

b) $\frac{1}{2}e^\pi$

c) $\frac{1}{2e^\pi}$

d) $\frac{2}{e^\pi}$

14. The derivative of $f(x) = 3|2 + x|$ at the point $x_0 = -3$, is

a) 3

b) -3

c) 0

d) Does not exist

15. If variables x and y are related by the equation $x = \int_0^y \frac{1}{\sqrt{1+9u^2}} du$, then $\frac{d^2y}{dx^2}$ is equal to

a) $\sqrt{1+9y^2}$

b) $\frac{1}{1+9y^2}$

c) $9y$

d) $\frac{1}{9}y$

16. If $f(x) = x \tan^{-1} x$, then $f'(1)$ is equal to

a) $\frac{1}{2} + \frac{\pi}{4}$

b) $-\frac{1}{2} + \frac{\pi}{4}$

c) $-\frac{1}{2} - \frac{\pi}{4}$

d) $\frac{1}{2} - \frac{\pi}{4}$

17. If $f: (-1, 1) \rightarrow \mathbb{R}$ be a differentiable function with $f(0) = -1$ and $f'(0) = 1$. Let $g(x) = [f(2f(x) + 2)]^2$. Then, $g'(0)$ is equal to

a) 4

b) -4

c) 0

d) -2

18. The differential coefficient of the function $|x - 1| + |x - 3|$ at the point $x = 2$ is

a) -2

b) 0

c) 2

d) undefined

19. If $y = \tan^{-1}(\sec x - \tan x)$, then $\frac{dy}{dx}$ is equal to

a) 2

b) -2

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

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

20. If $x = a \cos^4 \theta, y = a \sin^4 \theta$, then $\frac{dy}{dx}$ at $\theta = \frac{3\pi}{4}$ is

a) -1

b) 1

c) $-a^2$

d) a^2