



## MATHEMATICS CLASS XI

### CHAPTER-13 LIMITS AND DERIVATIVES

Q.1. Evaluate  $\lim_{x \rightarrow a} \frac{x^3-1}{x-1}$ .

Q.2. Differentiate  $x^3$ , using first principle.

Q.3. Find  $f'(x)$ , if  $f(x) = (x-2)^2(2x-3)$ .

Q.4. Find the derivative of  $f(x) = 1 + x + x^2 + \dots + x^{100}$  at  $x = 1$ .

Q.5. Find the derivative of  $\frac{x+\cos x}{\tan x}$ .

Q.6. If  $f(t) = \frac{2}{9}t^4 - \frac{5}{3}t^3 + 2t - 1$ , then find  $f'(-3)$ .

Q.7. Differentiate  $\frac{x+2}{x^2-3}$  and find the value of the derivative at  $x = 0$ .

Q.8. Find the derivative of  $(x + \cos x)(x - \tan x)$ .

Q.9. Let  $f(x)$  be a function defined by

$$f(x) = \begin{cases} 6x - 6, & x \leq 3 \\ 2x - k, & x > 3 \end{cases}$$

Q.10. Using the principle. find  $a$ , if  $f'(a) = 0$ , where  $f(x) = x^3 - 3x^2 + 3x - 1$ .

Q.11. Differentiate  $\frac{\sin x}{x}$  from first principle.

Q.12. Find the differential coefficient of  $\sec x$ , using first principle.

Q.13. Using first principle, find the derivative of  $\tan \sqrt{x}$ .

Q.14. Given,  $\lim_{x \rightarrow 0} \frac{\sin x - 2 \sin 3x + \sin 5x}{x}$



Q.15. We have,  $f(x) = \begin{cases} a + bx, & x < 1 \\ 4, & x = 1 \\ b - ax, & x > 1 \end{cases}$

Q.16. Given,  $f(x) = \begin{cases} mx^2 + n & x < 0 \\ nx + m, & 0 \leq x \leq 1 \\ nx^2 + m, & x > 1 \end{cases}$

Q.17. We have,  $f(x) = x^3 - 27$

Q.18. We have,  $f(x) = x^2 - 2$ .

Q.19. We have,  $f(x) = x^3 - 27$

Q.20. We have,  $f(x) = x^2 - 2$ .

Q.21. Given,  $f(x) = \begin{cases} \frac{\sin[x]}{[x]} & [x] \neq 0 \\ 0, & [x] = 0 \end{cases}$

Q.22. Given  $f(x) = \begin{cases} x^2 - 1, & 0 < x < 2 \\ 2x + 3, & 2 \leq x < 3 \end{cases}$

Q.23. Let  $f(x) = \cos\left(x - \frac{\pi}{8}\right)$

Q.24. Let  $y = \frac{\sin x + \cos x}{\sin x - \cos x}$

Q.25. We have,  $f(x) = \sin x + \cos x$

By using first principle of derivative,

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

Q.26. To prove,  $x \frac{dy}{dx} = y(1 - y)$

Q.27. Let  $y = \frac{(x-1)(x-2)}{(x-3)(x-4)}$

Q.28. Let  $f(x) = x^3 - 3x^2 + 3x - 1$



Q.30. We have,  $f(x) = \sec x$

Q.31. Let  $f(x) = \tan \sqrt{x}$

Q.32. Let  $y = (x \sin x + \cos x) (x \cos x - \sin x)$

Q.33. Let  $f(x) = \frac{4x+5 \sin x}{3x+7 \cos x}$

Q.34. Let  $y = \frac{(x-1)(x-2)}{(x-3)(x-4)}$

Q.35. Find the derivative of

$$X^n + ax^{n-1} + a^2x^{n-2} + \dots + a^{n-1}x + a^n \text{ for some fixed real number } a.$$

Q.36. Find the derivative of  $\frac{(x-1)(x-2)}{(x-3)(x-4)}$

Q.37. If  $y = \frac{x}{x+5}$ , then prove that

$$x \frac{dy}{dx} = y(1 - y)$$

Q.38. If we put  $x = 2$ , then the expression  $\frac{x^2 - x \log x + 2 \log x - 4}{x-2}$  becomes

indeterminate form  $\frac{0}{0}$ . Therefore,  $(x - 2)$  is a common factor of numerator and denominator both.

Q.39. Let  $f(x) = \frac{x + \cos x}{\tan x}$ .

Q.40. We have,  $\lim_{x \rightarrow 2} \frac{x^9 - a^9}{x - a} = \lim_{x \rightarrow 5} (4 + x)$