

Board – CBSE

Class – 11

Topic – Limits and Derivatives

1 Marks Questions

1. Evaluate

$$\lim_{x \rightarrow 3} \left[\frac{x^2 - 9}{x - 3} \right]$$

2. Evaluate

$$\lim_{x \rightarrow 0} \frac{\sin 3x}{5x}$$

3. Find derivative of 2^x 4. Find derivative of $\sqrt{\sin 2x}$

5. Evaluate

$$\lim_{x \rightarrow 0} \frac{\sin^2 4x}{x^2}$$

6. What is the value of

$$\lim_{x \rightarrow a} \left(\frac{x^2 - a^n}{x - a} \right)$$

7. Differentiate $\frac{2^x}{x}$ 8. If $y = e^{\sin x}$ find $\frac{dy}{dx}$

9. Evaluate

$$\lim_{x \rightarrow 1} \frac{x^{15} - 1}{x^{10} - 1}$$

10. Differentiate $x \sin x$ with respect to x

11. Evaluate

$$\lim_{x \rightarrow 1} \frac{x^2 + 1}{x + 100}$$

12. Evaluate $\lim_{x \rightarrow 0} [\operatorname{cosec} x - \cot x]$ 13. Find $f^{-1}(x)$ at $x = 100$

14. Evaluate

$$\lim_{x \rightarrow -2} \frac{\tan \pi x}{x + 2}$$

15. Find derivative of $\sin^n x$ 16. Find derivative of $1 + x + x^2 + x^3 + \dots + x^{50}$ at $x = 1$

17. The value of

$$\lim_{h \rightarrow 0} \frac{e^{2h} - 1}{h}$$

18. Evaluate

$$\lim_{x \rightarrow 0} \frac{(1+x)^6 - 1}{(1+x)^2 - 1}$$

19. $\lim_{x \rightarrow a} \frac{x^7 + a^7}{x+a} = 7$ find the value of 'a'

20. Differentiate $x^{-3}(5 + 3x)$

4 Marks Questions

21. Prove that

$$\lim_{x \rightarrow 0} \left(\frac{e^x - 1}{x} \right) = 1$$

22. Evaluate

$$\lim_{x \rightarrow 1} \frac{(2x-3)(\sqrt{x}-1)}{(2x^2+x-3)}$$

23. Evaluate

$$\lim_{x \rightarrow 0} \frac{x \tan 4x}{1 - \cos 4x}$$

24. If $y = \frac{(1+\tan x)}{(1+\tan x)}$ Show that $\frac{dy}{dx} = \frac{-2}{(1+\sin 2x)}$

25. Differentiate $e^{\sqrt{\cot x}}$

26. Let $f(x) \begin{cases} a + bx, & x < 1 \\ 4, & x = 1 \\ b - ax, & x > 1 \end{cases}$ and if $\lim_{x \rightarrow 1} f(x) = f(1)$ what are the possible value of a and b ?

27. If $y = \frac{1}{\sqrt{a^2 - x^2}}$, find $\frac{dy}{dx}$

28. Differentiate $\sqrt{\frac{1 - \tan x}{1 + \tan x}}$

29. Differentiate

(i) $\left(\frac{\sin x + \cos x}{\sin x - \cos x} \right)$

(ii) $\left(\frac{\sin x - 1}{\sec x + 1} \right)$

30. Evaluate

$$\lim_{x \rightarrow \frac{\pi}{4}} \frac{\sin x - \cos x}{\left(x - \frac{\pi}{4}\right)}$$

31. Evaluate

$$\lim_{x \rightarrow 0} \frac{(1+x)^6 - 1}{(1+x)^5 - 1}$$

32. Evaluate

$$\lim_{x \rightarrow a} \frac{\sqrt{a+2x} - \sqrt{3x}}{\sqrt{3a+x} - 2\sqrt{x}}$$

33. Find the derivative of $f(x) = 1 + x + x^2 + \dots + x^{50}$ at $x = 1$

34. Find the derivative of $\sin^2 x$ with respect to x using product rule

35. Find the derivative of $\frac{x^5 - \cos x}{\sin x}$ with respect to x .

36. Find $\lim_{x \rightarrow 0} f(x)$

37. Find the derivative of the function $f(x) = 2x^2 + 3x - 5$ at $x = -1$ Also show that

$$f'(0) + 3f'(-1) = 0$$

38. Evaluate

$$\lim_{x \rightarrow 0} \frac{ax + x \cos x}{b \sin x}$$

39. Find derivative $\tan x$ of by first principle

40. Evaluate

$$\lim_{x \rightarrow 1} \frac{x + x^2 + x^3 + \dots + x^n - n}{(x - 1)}$$

41. Evaluate

$$\lim_{x \rightarrow 4} \frac{|4 - x|}{x - 4} \text{ (if it exist)}$$

42. For what integers m and n does both

$$\lim_{x \rightarrow 4} f(x) \text{ and } \lim_{x \rightarrow 1} f(x) \text{ exist it}$$

$$f(x) = \begin{cases} mx^2 + n; & x < 0 \\ nx + m; & 0 \leq x \leq 1 \\ nx^3 + m; & x > 1 \end{cases}$$

43. If $y = \sqrt{x} + \frac{1}{\sqrt{x}}$. Prove that $2x \frac{dy}{dx} + y = 2\sqrt{x}$

44. Evaluate

$$\lim_{x \rightarrow \frac{\pi}{2}} \frac{1 + \cos 2x}{(\pi - 2x)^2}$$

45. Differentiate the function $y = \frac{(x+2)(3x-1)}{(2x+5)}$ with respect to x

46. Find $\lim_{x \rightarrow 5} |5| - 5$

47. Find

$$\lim_{x \rightarrow 0} f(x) \text{ and } \lim_{x \rightarrow 1} f(x) \text{ where } f(x) = \begin{cases} 2x + 3; & x \leq 0 \\ 3(x + 1); & (x > 0) \end{cases}$$

48. Find derivative of $\sec x$ by first principle

49. Find derivative of

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

50. Find derivative of

$$\frac{x^n - a^n}{x - a}$$

6 Marks Questions

51. Differentiate $\tan x$ from first principle.

52. Differentiate $(x + 4)^6$ From first principle.

53. Find derivative of $\operatorname{cosec} x$ by first principle.

54. Find the derivatives of the following fuchsias:

(i) $\left(x - \frac{1}{x}\right)^3$

(ii) $\frac{(3x + 1)(2\sqrt{x} - 1)}{\sqrt{x}}$

55. If $f(x) = \begin{cases} |x| + a; & x < 0 \\ 0; & x = 0 \\ |x| - a; & x > 0 \end{cases}$ for what values of 'a' does $\lim_{x \rightarrow 0} f(x)$ exist

56. Find the derivative of $\sin(x + 1)$ with respect to x , from first principle.

57. Find the derivative of $\sin x + \cos x$ from first principle

58. Find derivative of

(i) $\frac{x \sin x}{1 + \cos x}$

(ii) $(ax + b)(x + d)^2$

59. Evaluate

$$\lim_{h \rightarrow 0} \frac{(a+h)^2 \sin(a+h) - a^2 \sin a}{h}$$

60. Differentiate

(i) $\left(\frac{a}{x^4}\right) - \frac{b}{x^2} + \cos x$

(ii) $(x + \cos x)(x - \tan x)$