

**CLASS XI – MATHEMATICS – CHAPTER 13**

**LIMITS AND DERIVATIVE**

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**Q01.** Evaluate

(a)  $\lim_{x \rightarrow 3} \frac{[x^2 - 9]}{[x - 3]}$

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

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

(d)  $\lim_{x \rightarrow 1} \frac{[x^{15} - 1]}{[x^{10} - 1]}$

(e)  $\lim_{x \rightarrow 1} \frac{[x^2 + 1]}{[x + 100]}$

(f)  $\lim_{x \rightarrow 0} [\operatorname{cosec} x - \cot x]$

(g)  $\lim_{x \rightarrow 2} \frac{\tan \pi x}{x + 2}$

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

(i)  $\lim_{x \rightarrow \pi/4} \frac{\sin x - \cos x}{(x - \pi/4)}$

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

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

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

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

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

**Q02.** Find derivative of  $2^x$

**Q03.** Find derivative of  $\sqrt{\sin 2x}$

**Q04.** What is the value of  $\lim_{x \rightarrow a} \frac{(x^2 - a^n)}{(x - a)}$

**Q05.** Differentiate  $2^x/x$

**Q06.** If  $y = e^{\sin x}$  find  $dy/dx$

**Q07.** Differentiate  $x \sin x$  with respect to  $x$ .

**Q08.** Find  $f^{-1}(x)$  at  $x = 100$ . If  $f(x) = 99x$

**Q09.** Find derivative of  $\sin^n x$ .

**Q10.** Find derivative of  $1 + x + x^2 + x^3 + \dots + x^{50}$  at  $x = 1$ .

**Q11.** Differentiate  $[a/x^4 - (b/x^2) + \cos x]$

**Q12.** Find the value of 'a'. If  $\lim_{x \rightarrow 1} \frac{(x^7 + a^7)}{(x + a)}$

**Q13.** Differentiate  $[x^{-3}(5 + 3x)]$

**Q14.** Differentiate  $(x + \cos x)(x - \tan x)$

**Q15.** Evaluate  $\lim_{x \rightarrow 1} \frac{(2x - 3)(\sqrt{x} - 1)}{(2x^2 + x - 3)}$

**Q16.** Evaluate  $\lim_{x \rightarrow 0} \frac{(x \tan 4x)}{(1 - \cos 4x)}$

**Q17.** If  $y = [(1 - \tan x)/(1 + \tan x)]$ . Show that  $dy/dx = -2/(1 + \sin 2x)$

**Q18.** Differentiate  $(\sin x + \cos x)/(\sin x - \cos x)$

**Q19.** Let  $f(x) \{(a + bx, x < 1) (4, x = 1) (b - ax, x > 1)\}$  and if  $\lim_{x \rightarrow 1} f(x) = f(1)$ . What are the possible value of  $a$  and  $b$ ?

**Q20.** If  $y = 1/\sqrt{a^2 - x^2}$ . Find  $dy/dx$

**Q21.** Differentiate  $[\sqrt{1 - \tan x}/\sqrt{1 + \tan x}]$

**Q22.** Differentiate  $(\sin x - 1)/(\sin x + 1)$

# DCA CLASSES

- Q23.** Find the derivative of  $\sin x + \cos x$  from first principle.
- Q24.** Find the derivative of  $\sin^2 x$  with respect to  $x$  using product rule.
- Q25.** Find the derivative of  $(x^5 - \cos x)/\sin x$  with respect to  $x$ .
- Q26.** Find  $\lim_{x \rightarrow 0} f(x)$ , when  $f(x) = \{|x|/x ; x \neq 0\}$  ( $0; x = 0$ )
- Q27.** Find the derivative of the function  $f(x) = 2x^2 + 3x - 5$  at  $x = -1$ . Also show that  $f'(0) + 3f'(-1) = 0$
- Q28.** Find the derivative of  $\sin(x+1)$  with respect to  $x$ , from first principle.
- Q29.** Find derivative of  $\tan x$  by first principle.
- Q30.** Evaluate  $\lim_{x \rightarrow 4} \frac{|4-x|}{x-4}$  (if it exist)
- Q31.** For what integers  $m$  and  $n$  does both  $\lim_{x \rightarrow 4} f(x)$  and  $\lim_{x \rightarrow 1} f(x)$  exist if  $f(x) = \{(mx^2 + n; x < 0)(nx + m; 0 \leq x \leq 1)(nx^3 + m; x > 1)\}$
- Q32.** Find derivative of  $(x^n - a^n)/(x - a)$
- Q33.** If  $y = [\sqrt{x} + (1/\sqrt{x})]$ , Prove that  $2x dy/(dx + y) = 2\sqrt{x}$
- Q34.** Differentiate the function  $y = [(x+2)(3x-1)/(2x+5)]$  with respect to  $x$ .
- Q35.** Find  $\lim_{x \rightarrow 5} |x| - 5$
- Q36.** Find  $\lim_{x \rightarrow 0} f(x)$  and  $\lim_{x \rightarrow 1} f(x)$  where  $f(x) = \{(2x+3; x \leq 0)(3(x+1); x > 0)\}$
- Q37.** Find derivative of  $\sec x$  by first principle.
- Q38.** Find derivative of  $f(x) = [(4x + 5\sin x)/(3x + 7\cos x)]$
- Q39.** Differentiate  $\tan x$  from first principle.
- Q40.** Differentiate  $(x+4)^6$  from first principle.
- Q41.** Find derivative of  $\operatorname{cosec} x$  by first principle.
- Q42.** Find the derivatives of the following :
- (a)  $[x - (1/x)^3]$  (b)  $[(3x+1)(2(\sqrt{x}-1)/\sqrt{x})]$
- Q43.** If  $f(x) = \{|x| + a; x < 0\}$  ( $0; x = 0$ ) ( $|x| - a; x > 0$ ) for what values of 'a'  $\lim_{x \rightarrow 0} f(x)$  exist.
- Q44.** Find derivative of the following :
- (a)  $x \sin x/(1 + \cos x)$  (b)  $(ax + b)(x + d)^2$
- Q45.** Evaluate  $\lim_{h \rightarrow 0} \frac{(a+h)^2 \sin(a+x) - a^2 \sin a}{h}$