

**CLASS – XII SUBJECT – MATHEMATICS ASSIGNMENT NO. 3 TOPIC – CONTINUITY & DIFFERENTIATE**

- Find the point of discontinuity for the function  $f(x) = \begin{cases} \frac{x^4 - 16}{x - 2} & x \neq 2 \\ 16 & x = 2 \end{cases}$
- Show that  $f(x) = \begin{cases} 5x - 4 & a < x < 1 \\ 4x^3 - 3x & 1 < x < 2 \end{cases}$  is continuous at  $x = 1$
- For what value of K in the for continuous  $x = 0$ ,  $f(x) = \frac{1 - \cos 4x}{8x^2}$   $x \neq 0$
- If  $f(x) = \begin{cases} 3ax + b & \text{if } x > 1 \\ 11 & \text{if } x = 1 \end{cases}$   $5ax - 2b$  if  $x < 1$  is continuous at  $x = 1$ . find a, b
- If  $f(x)$  is differentiable at  $x = a$  find  $\lim_{x \rightarrow a} \frac{x^2 f(a) - a^2 f(x)}{x - a}$
- Find values of a, b such that  $f(x)$  given by  $f(x) = \begin{cases} 1 & : x \leq 3 \\ ax + b & 3 < x < 5 \\ 7 & \text{if } x \geq 5 \end{cases}$
- If  $y = -\cot^2 \frac{x}{2} - x$  by  $\sin \frac{x}{2}$ , prove :  $\frac{dy}{dx} = \cot 3 \frac{x}{2}$
- If  $x = \cos \theta$ ,  $y = \sin \theta - \theta \cos \theta$ , prove  $\frac{d^2 y}{dx^2} = \frac{\sec^2 \theta}{\theta}$
- If  $y = 2 - 3 \cos x$ , find  $\frac{dy}{dx}$  at  $x = \frac{\pi}{6}$
- If  $y = 10 \log (1 + \cos x)$ , Prove  $\frac{d^3 y}{dx^3} + \frac{d^2 y}{dx^2} \cdot \frac{dy}{dx} = 0$
- If  $y = \tan^{-1} \frac{\sqrt{a^2 + x^2} + \sqrt{a^2 - x^2}}{\sqrt{a^2 + x^2} - \sqrt{a^2 - x^2}}$  show that  $\frac{dy}{dx} = \frac{-2a^2}{x^3} \left( 1 + \frac{a^2}{\sqrt{a^4 - x^4}} \right)$
- If  $Y = \sqrt{\frac{1 + e^x}{1 - e^x}}$ , then show that  $\frac{dy}{dx} = \frac{e^x}{(1 - e^x)\sqrt{1 - e^{2x}}}$
- If  $y = \sin^{-1} [x \sqrt{1 - x} - \sqrt{x} \sqrt{1 - x^2}]$  find  $\frac{dy}{dx}$
- If  $y = \sin^{-1} \left( \frac{x^2 - y^2}{x^2 + y^2} \right) = \tan^{-1} a$ , prove :  $\frac{dy}{dx} = \frac{y}{x}$
- If  $e^y = y^x$ , prove  $\frac{dy}{dx} = \frac{(\log y)^2}{\log y - 1}$
- If  $x = a(\cos t + \log \tan \frac{t}{2})$ ,  $y = a \sin t$  then find  $\frac{dy}{dx}$  at  $t = \frac{\pi}{4}$
- Differentiate  $e^{\sin x} + (ax)^x$  w.r.t. x.
- If  $y = e^x (\sin x + \cos x)$  Prove :  $\frac{d^2 y}{dx^2} - \frac{2dy}{dx} + 2y = 0$
- If  $x = 3 \sin t - \sin 3t$ ,  $y = 3 \cos t - \cos 3t$  find  $\frac{d^2 y}{dx^2}$  at  $t = \frac{\pi}{2}$

20. Find  $dy$  if (i)  $x = a \sqrt{1+t^2}$ ,  $y = 2t$  (ii)  $x = 1 + 10gt$ ,  $y = 2 \sin \theta$
21. Find  $\frac{dy}{dx}$ , if (i)  $x = a \frac{(1+t^2)}{1-t^2}$ ,  $y = \frac{2t}{1-t^2}$ , (ii)  $x = \frac{1+\log t}{E^2}$ ,  $y = 2 \sin \theta - \sin^2 \theta$  (iii)  $x^y = y^x$
22. If  $e^y (x+1) = 1$ , Prove that  $\frac{dy}{dx} = \left( \frac{dy}{dx} \right)^2$
23. If  $x^4 = c^{x-y}$ , then prove that  $\frac{dy}{dx} = \frac{\log x}{\log(ex)^2}$
24. If  $\sin(x, y) = x^2 - y$ , find  $\frac{dy}{dx}$
25. If  $e^x + e^y = e^{x+y}$  prove that  $\frac{dy}{dx} = e^{y-x}$
26. Find  $\frac{dy}{dx}$  if  $\cos(x+y) = y \sin a$ .
27. If  $x \sqrt{1+y} = y \cdot \sqrt{1+x} = 0$  then prove that  $\frac{dy}{dx} = \frac{-1}{\sqrt{1+x^2}}$
28. If  $x \sqrt{1-y^2} + y \sqrt{1-x^2} = 1$ , then prove  $\frac{dy}{dx} = \frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$
29. If  $y = x(a+y)$  show :  $\frac{dy}{dx} = \frac{\sin^2(a+y)}{\sin a}$
30. If  $\sqrt{1-x^2} + \sqrt{1-y^2} = a(x-y)$ , prove  $\frac{dy}{dx} = \frac{\sqrt{1-y^2}}{\sqrt{1-x^2}}$