



## MATHEMATICS CH- 5- DIERIVATIVES

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

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

Class: XII Sec: \_\_\_\_

1. Show that the function  $f(x) = 2x - |x|$  is continuous but not differentiable at  $x = 0$ .

2. Find the value of  $a$  for which the function defined as

$$f(x) = a \sin \frac{\pi}{2}(x+1), x \leq 0$$

$$\frac{\tan x - \sin x}{x^3}, x > 0$$

is continuous at  $x = 0$ .

3. If  $xy = e^{x-y}$ , then show that  $\frac{dy}{dx} = \frac{\log x}{\{\log(xe)\}^2}$

4. If  $y = \log \tan \left( \frac{\pi}{4} + \frac{x}{2} \right)$ , then show that  $\frac{dy}{dx} - \sec x = 0$ .

5. If  $x = \cos t(3 - 2\cos 2t)$  and  $y = \sin t(3 - 2\sin 2t)$ , then find the value of  $\frac{dy}{dx}$  at  $t = \frac{\pi}{4}$ .

6. Differentiate  $\tan^{-1} \left( \frac{\sqrt{1-x^2}}{x} \right)$  with respect to  $\cos^{-1} \left( \frac{2x\sqrt{1-x^2}}{1-x^2} \right)$

7. If  $y = \cos^{-1} \frac{2^{x+1}}{1+4^x}$  then find  $\frac{dy}{dx}$

8. If  $y = (\tan^{-1} x)^2$ , show that  $(x^2+1)^2 \frac{d^2y}{dx^2} + 2x(x^2+1) \frac{dy}{dx} = 2$

9. If  $y = \sin(\log x)$ , then prove that  $x^2 \frac{d^2y}{dx^2} + x \frac{dy}{dx} + y = 0$

10. If  $y = \operatorname{cosec}^{-1} x$ , then show that  $x(x^2-1) \frac{d^2y}{dx^2} + (2x^2-1) \frac{dy}{dx} = 0$ .

11. Verify Rolles Theorem for the function  $f(x) = x^2 + 2x - 8$  where  $x$  belongs to  $[-4, 2]$

12. Verify Mean Value Theorem for the function  $f(x) = x^2 - 4x - 3$  in the interval  $[1, 4]$ .