

Class – 12<sup>th</sup>

Chapter-7

Subject Maths

Worksheet-31

Differentiation

1. Find  $\frac{d^2y}{dx^2}$ , when

(a)  $y = x^3 + \tan x$

(b)  $y = x^2 + 3x + 2$

(c)  $y = x \cos x$

(d)  $y = 2 \sin x + 3 \cos x$

(e)  $y = e^{-x} \cos x$

(f)  $y = a \sin x - b \cos x$

2. If  $y = a \sin x + b \cos x$ , then prove that

$$\frac{d^2y}{dx^2} + y = 0.$$

3. If  $y = \sec x + \tan x$ , then prove that

$$\frac{d^2y}{dx^2} = \frac{\cos x}{(1 - \sin x)^2}.$$

4. If  $y = a \cos nx + b \sin nx$ , then prove that

$$\frac{d^2y}{dx^2} + n^2y = 0.$$

5. If  $x = a \cos^3 \theta$ ,  $y = a \sin^3 \theta$ , then find  $\frac{d^2y}{dx^2}$  at  $\theta = \frac{\pi}{4}$

6. If  $x^3 + y^3 - 3axy = 0$ , then prove that

$$\frac{d^2y}{dx^2} = \frac{2a^2xy}{(ax - y^2)^3}.$$

7. If  $y = \sin^{-1} x$ , then prove that :  $(1 - x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} = 0$ .

8. If  $y = (\sin^{-1} x)^2$ , then prove that :  $(1 - x^2) \frac{d^2y}{dx^2} - x \frac{dy}{dx} - 2 = 0$ .