

ATOMIC ENERGY EDUCATION SOCIETY, MUMBAI
CLASS: XII (MATHEMATICS)

CHAPTER - 09
TOPIC: DIFFERENTIAL EQUATIONS
WORKSHEET: MODULE 2/3

1. Find the general solution of the following differential equations:-

- (i) $y \log x \, dx - x \, dy = 0$
- (ii) $\sec^2 x \tan y \, dx + \sec^2 y \tan x \, dy = 0$
- (iii) $(x^2 - yx^2) \, dy + (y^2 + x^2 y^2) \, dx = 0$

2. Find the particular solution of the following differential equations satisfying the given conditions:-

- (i) $(x^3 + x^2 + 1) \frac{dy}{dx} = 2x^2 + x; y = 1 \text{ when } x = 0$
- (ii) $(1 + e^{2x}) \, dy + (1 + y^2) e^x \, dx = 0; y = 1 \text{ when } x = 0$
- (iii) $\cos\left(\frac{dy}{dx}\right) = a \ (a \in \mathbb{R}); y = 1 \text{ when } x = 0$

3. At any point (x, y) of a curve, the slope of the tangent is twice the slope of the line segment joining the point of contact to the point $(-4, -3)$. Find the equation of the curve given that it passes through $(-2, 1)$.

4. The volume of spherical balloon being inflated changes at a constant rate. If initially its radius is 3 units and after 3 seconds it is 6 units. Find the radius of balloon after t seconds.

5. Find the general solution of the following differential equations:-

- (i) $(x^2 + x y) \, dy = (x^2 + y^2) \, dx$
- (ii) $y \, dx + x \log\left(\frac{y}{x}\right) \, dy - 2x \, dy = 0$
- (iii) $(x \, dy - y \, dx) y \sin\left(\frac{y}{x}\right) = (y \, dx + x \, dy) x \cos\left(\frac{y}{x}\right)$
- (iv) $y e^{\frac{x}{y}} \, dx = \left(x e^{\frac{x}{y}} + y^2\right) \, dy$

6. Find the particular solution of the following differential equations satisfying the given conditions:-

(i) $\frac{dy}{dx} - \frac{y}{x} + \operatorname{Cosec}\left(\frac{y}{x}\right) = 0$, $y = 0$ when $x = 1$

(ii) $(x^2 - y^2)dx + 2xy dy = 0$, $y = 0$ when $x = 1$

(iii) $[x \operatorname{Sin}^2\left(\frac{y}{x}\right) - y] + xdy = 0$, $y = \frac{\pi}{4}$ when $x = 1$
