INTERNATIONAL INDIAN SCHOOL BURAIDAH

Worksheet for the Academic Year 2026-27

CLASS: 12 SUBJECT: MATHEMATICS DATE: 08/11/2026

LESSON: 9 – DIFFERENTIAL EQUATIONS

1. The product of degree and order of $\frac{d^2y}{dx^2}\ siny + (\frac{dy}{dx})^3 cosy = \sqrt{y}\ is$

[a) 3 b) 2 c) 6 d) not defined.]

2. The number of solutions of $\frac{dy}{dx} = \frac{y+1}{x+1}, when\ y(1) = 2\ is$

[a) none b) one c) two d) infinite][

3. The solution of $\frac{dy}{dx} - y = 1\ , y(\ 0) == 1\ , is\ given\ by$

[a) $xy = -e^{-x}$ $b)\ xy = -e^{x}$ $c\ )\ xy = -1$ $d)\ y = 2e^{x} - 1$]

3. The integrating factor of $)x + 2y^3)\frac{dy}{dx} = 2y\ is$

[a) $e^{\frac{y^2}{2}}$ $b)\ \frac{1}{\sqrt{y}}$ $c)\ \frac{1}{y^2}$ $d)\ e^{-\frac{1}{y^2}}$]

4. Determine the order and degree of the following:

I) $5\frac{d^2y}{dx^2} = [1 + \left(\frac{dy}{dx}\right)^2]^{\frac{3}{2}}$ ii) $\frac{[1+\left(\frac{dy}{dx}\right)^2]}{\frac{d^2y}{dx^2}}$ = k

iii) $\frac{d^2y}{dx^2} + 3(\frac{dy}{dx})^2 = x^2 log\frac{d^2y}{dx^2}$ iv) $2\frac{d^2y}{dx^2} + 3\sqrt{1 - (\frac{dy}{dx})^2 - y}$ = 0

5. Show that, xy = $ae^{x} + be^{-x} + x^2$ is a solution of the differential equation

$$x\frac{d^2y}{dx^2} + 2\frac{dy}{dx} - xy + x^2 - 2 = 0$$

6. Solve the following differential equation :

i) $\frac{dy}{dx} = xe^{x} + sin^3 x cos^2 x$ $ii)\ (1 + x^2\ )\frac{dy}{dx} - x = 2\tan^{-1} x$

iii) $\sin\left(\frac{dy}{dx}\right) = k\ ; y(0) = 1$ $iv)\sqrt{a + x}\ dy + xdx = 0$

v) $\frac{dy}{dx} = \frac{3e^{2x}+3e^{4x}}{e^{x}+e^{-x}}$ $vi)e^{\frac{dy}{dx}} = x + 1\ ; y(0) = 1$

vii) (1+y^2 ((1+logx)dx + xdy = 0 ; when x = 1, y=1 viii) y- $x\frac{dy}{dx} = (\ y^2 + \frac{dy}{dx})$

ix) $\log\frac{dy}{dx} = 3x + 4y$ $x)\ \frac{dy}{dx} = \frac{e^{x}(sin^2 x\ sin2x)}{y(2logy+1)}$ xi) $(x^2 - 2y^2)dx + 2xydy = 0$

xii) $\frac{dy}{dx} = \frac{y-x}{y+x}$ $xiii)\ \left(xe^{\frac{y}{x}} + y\right)dx = xdy$ $xiv)\frac{dy}{dx} = \frac{y}{x}\{\log\left(\frac{y}{x}\right) + 1\}$

xv) xy $\log(\frac{x}{y})dx + \left\{y^2 - x^2\log\left(\frac{x}{y}\right)\right\}dy = 0$ xvi) $(1+x^2)\frac{dy}{dx} + 2xy - 4x^2 = 0$

xvii) $(x^2+1)y' - 2xy = (x^4 + 2x^2 + 1)cosx$ $xviii)\sqrt{1-y^2}dx = (\sin^{-1}y - x)dy$

7. Find the equation of the curve that passes through the point (0, a) and is such that at any point (x, y) on it, the product of its slope and ordinate is equal to the abscissa.

8. Solve : $y + \frac{d}{dy}(xy) = x(sinx + x)$