ATOMIC ENERGY EDUCATION SOCIETY, MUMBAI

CLASS: XII (MATHEMATICS)

CHAPTER - 09

TOPIC: DIFFERENTIAL EQUATIONS

WORKSHEET: MODULE 1/3

1. **Write the order and degree of each of the following differential equations:-**

(i) $\frac{d^3y}{dx^3} + 2\left(\frac{d^2y}{dx^2}\right) - \frac{dy}{dx} + y = 0$

(ii) $xy\left(\frac{d^2y}{dx^2}\right) - \left(\frac{dy}{dx}\right)^4 = x\left(\frac{d^4y}{dx^4}\right)^3$

(iii) $y = x\left(\frac{d^2y}{dx^2}\right) + c\sqrt{1 + \left(\frac{dy}{dx}\right)^2}$

(iv) $x\left(\frac{d^5y}{dx^5}\right)^2 + 6y\,Sin\left(\frac{d^3y}{dx^3}\right) + 2\left(\frac{dy}{dx}\right)^4 = e^x$

(v) $\left(\frac{d^2y}{dx^2}\right) + 4\left(\frac{d^2y}{dx^2}\right)^3 = x^5 log\left(\frac{d^2y}{dx^2}\right)$

2. **Verify that $x^2 + 4y = 0$ is a solution of differential equation** $\left(\frac{dy}{dx}\right)^2 + x\frac{dy}{dx} - y = 0$

3. **Verify that $y = x \sin x$ is a solution of differential equation** $x y' = y + x\sqrt{x^2 - y^2}$ **($x \neq 0$ and $x > y$ or $x < -y$)**

4. **Show that y = 2 - $\frac{3x}{2x+1}$ is a solution of differential equation** $y - x\frac{dy}{dx} = 2\left(1 + x^2\frac{dy}{dx}\right)$,

5. **Show that $x y = \log y + C$ is a solution of differential equation** $\frac{dy}{dx} = \frac{y^2}{1-xy}$, **($x y \neq 1$).**

6. **Verify that y = $log\left(x + \sqrt{x^2 + a^2}\right)^2$ is a solution of differential equation** $(a^2 + x^2)\frac{d^2y}{dx^2} + x\frac{dy}{dx} = 0$.

7. **Show that** $y = c_1 e^{ax} Cos\ bx + c_2 e^{ax} Sinbx$ **is a solution of differential equation** $\frac{d^2y}{dx^2} - 2a\frac{dy}{dx} + (a^2 + b^2)y = 0$ **.**
8. **Show that y = Cos (Cos x) is a solution of differential equation** $\frac{d^2y}{dx^2} - Cot\ x\ \frac{dy}{dx} + y\ Sin^2 x = 0.$
9. **Show that y = x Sin 3x is a solution of differential** $\frac{d^2y}{dx^2} + 9\ y - 6\ Cos\ 3x\ = 0$ **.**
10. **Verify that y = 3 Cos (log x) + 4 Sin (log x) is a solution of differential** $x^2\ \frac{d^2y}{dx^2} + x\ \frac{dy}{dx} + \ y = 0$ **.**
