

Assignment - 2

Date = 22/08/2023
No Need to Submit

1. Solve $D^2 y + 2Dy + 2y = e^{-x} \sec^3 x$

Ans - $e^{-x} \left[C_1 \cos x + C_2 \sin x + \frac{\tan x \sin x}{2} \right]$

2. Solve $D^2 y + a^2 y = x \cos ax$

Ans - $C_1 \cos ax + C_2 \sin ax + \frac{2}{a} \sin ax + \frac{1}{a^2} \cos ax \cdot \log \cos ax$

3. Solve $(D^2 + 4)y = \tan 2x$

Ans - $C_1 \cos 2x + C_2 \sin 2x - \frac{1}{4} \cos 2x \log(x \cos 2x + \tan 2x)$

4. Find the nature of singularities at $x = \infty$:

a. $y'' + \omega^2 y = 0 \quad \omega > 0$

b. $y'' - 2xy' + 2xy = 0 \quad x > 0$

5. Find the nature of singularities at $x = -1, +1, \infty$:

a. $(1-x^2)y'' - 2xy' + \lambda(1+x)y = 0 \quad \lambda \geq 0, \text{ integer.}$

b. $(1-x^2)y'' - xy' + n^2 y = 0$

6. Find two independent series of ascending powers of x which satisfy the differential equation:

$$y''(x) + xy(x) = 0$$

7. Obtain two linearly independent solutions of the equation $x^2 y'' + 2x^2 y' - 2y = 0$, which is valid near $x = 0$.

8. Show that infinity is not a regular singular point for the equation $y'' + ay' + by = 0$, where a, b are non zero constants.