

Directions: If possible, please write neatly. Box in your answers. ANS

1. Use the method of undetermined coefficients, solve the

$$\text{IVP: } \begin{cases} y''' - 2y'' + y' = 12x^2 e^x \\ y(0) = 1, y'(0) = 2, y''(0) = 27. \end{cases}$$

60 points

2. Use the method of variation of parameters find the general solution of the following differential equation:

$$y'' + 4y = \csc^2 2x, \quad x > 0$$

$$\left(\text{Recall } \csc^2 2x = 1/\sin^2 2x \right)$$

40 points

OPTIONAL

3. Solve the IVP:
$$\begin{cases} y'' - \frac{4}{x}y' + \frac{6}{x^2}y = 1, \quad x > 0, \\ y(1) = 2, \quad y'(1) = 7, \end{cases}$$

Given that $y_1(x) = x^2$ and $y_2(x) = x^3$ are solutions of the

associated homogeneous equation: $y'' - \frac{4}{x}y' + \frac{6}{x^2}y = 0, \quad x > 0.$

10 points

4. Set up an appropriate form of a particular solution $y_p(x)$, but do not determine the values of the coefficients of the following equation:

$$y^{(6)} - 3y^{(4)} + 3y'' - y = 5x e^{-x} + 4x^2 e^x$$

5 points

5. Find the general solution: $y^{(6)} - 7y''' + 18y'' - 20y' + 8y = 0$

5 points