# Math 54 Worksheet

## NON-HOMOGENEOUS SECOND-ORDER LINEAR DIFFERENTIAL EQUATIONS

## Part A

These questions test your knowledge of the core concepts and computations.

1. Write a trial solution for the method of undetermined coefficients (Do not determine the coefficients)

    (a) $y'' - ey' + 2y = e^x + \sin x$

    (b) $y'' + 2y' + 10y = x^2 e^{-x} \cos 3x$

    (c) $y'' - 6y' + 9y = e^{3x} + x \sin 2x$

    **Solution:**

2. Solve the differential equations

    (a) $9y'' + y = e^{2x}$

    (b) $y'' - 4y' + 4y = x - \sin x$

**Solution:**

# Part B

These questions are generally more challenging, often highlighting important subtleties. They require a deeper understanding of each concept and the interrelations between them.

3. Solve the initial-value problems

   (a) $y'' - 2y' + 5y = \sin x$, $y(0) = 1$, $y'(0) = 1$

   (b) $y'' + y' - 2y = x + \sin 2x$, $y(0) = 1$, $y'(0) = 0$

**Solution:**