Math 240 - Assignment 7

Name _____

October 15, 2026

Score _____

Show all work to receive full credit. Supply explanations when necessary. This assignment is due October 22.

1. Use undetermined coefficients to solve the following equation.

$$y'' + 2y' + y = 2x + 3 - e^5 x$$

2. Use undetermined coefficients to solve the following equation.

$$2y'' + 6y' - 20y = 60 \sin 2x$$

3. Solve the initial value problem: $y'' - 5y' + 4y = 2e^{4x} \quad y(0) = 1,\ y'(0) = -1$

4. Solve the initial value problem: $y^{(3)} + y'' = x + e^{-x} \quad y(0) = 1,\ y'(0) = 0,\ y''(0) = 1$

5. Consider the following equation:

$$y'' - 6y' + 9y = 5t^6 e^{3t}.$$

Solve the corresponding homogeneous equation. Then find the appropriate form of the particular solution for the nonhomogeneous equation. Do not solve for the undetermined coefficients.

6. Consider the following equation:

$$y'' + y = \sin t + t \cos t + e^t.$$

Solve the corresponding homogeneous equation. Then find the appropriate form of the particular solution for the nonhomogeneous equation. Do not solve for the undetermined coefficients.

7. Use variation of parameters to solve the following differential equation.

$$x'' - 4x' + 4x = \frac{e^{2t}}{t^2}, \quad t > 0$$

8. Use variation of parameters to solve $y'' + y = \csc^2 x$.

9. Consider the equation $(1 - x)y'' + xy' - y = (1 - x)^2$ for $x > 1$.

   (a) Verify that $y_1(x) = x$ and $y_2(x) = e^x$ are solutions of the corresponding homogeneous equation.

   (b) Use the Wronskian to show that y_1 and y_2 are linearly independent on $(1, \infty)$.

   (c) Use variation of parameters to find a particular solution.

   (d) What is the general solution?

   (e) Find the solution that satifies $y(2) = 1$ and $y'(2) = -4$.