

Math 240 - Assignment 6

March 5, 2025

Name _____

Score _____

Show all work to receive full credit. Supply explanations when necessary. This assignment is due March 24.

1. Use undetermined coefficients to solve the following equation.

$$2y'' + y = 9e^{2t}$$

2. Use undetermined coefficients to solve the following equation.

$$4y'' + 11y' - 3y = -2te^{-3t}$$

3. Solve the initial value problem.

$$y'' - y' - 2y = \cos x - \sin 2x, \quad y(0) = -7/20, \quad y'(0) = 1/5$$

4. Consider the following equation:

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

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

5. Consider the following equation:

$$x'' - x' - 2x = e^t \cos t - t^2 + t + 1.$$

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

6. Use variation of parameters to solve $y'' - 2y' - 8y = 3e^{-2x}$.

7. Use variation of parameters to solve $y'' + 9y = \sec^2(3t)$.

8. Consider the equation $(x - 1)y'' - xy' + y = 0$. It is easy to verify that $y_1(x) = x$ is a solution. (You did so for Assignment 4.)

(a) Use the *2nd Solution from a 1st* theorem on your undetermined coefficients hand-out to write the indefinite integral needed for a second solution. (Be sure to apply the theorem correctly.)

(b) If you've done part (a) correctly, you should be able to write your integral as the difference of two integrals. Use integration by parts on one of the two, and you should then be able to determine your original integral.

(c) What is the general solution of the differential equation?

(d) Use variation of parameters to solve the nonhomogeneous equation

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