

Name : _____ Partners : _____

1. Use the method of Variation of Parameters to find a general solution to the following DEs.

(a) $y'' - 10y' + 25y = e^{5x} \ln x, \quad x > 0$

(b) $ty'' + (1 - 2t)y' + (t - 1)y = te^t, \quad t > 0$

(Hint: First, show that e^t and $e^t \ln t$ are solutions to the corresponding homogeneous equation.)

2. Find a general solution to the following DEs.

(a) $[(D + 5)^3(D^2 - 4D + 5)^2][y] = 0$

(b) $y^{(4)} - 2y^{(3)} - 2y'' + 8y = 0$ (Hint: $e^{-x} \cos x$ is a solution.)

3. Use the annihilator method to find only the form of a particular solution of the following DEs

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

(b) $[(D + 1)(D - 2)^3(D^2 - 6D + 13)^2][y] = xe^{2x} + x^2e^{3x} \cos 2x$

4. Find the values of a , b , and c such that e^{2x} and $e^{-x} \cos 2x$ are solutions of the equation,

$$y^{(3)} + ay'' + by' + cy = 0.$$

5. (a) Find a general solution to the DE, $y''' + y'' - 5y' + 3y = 6e^x + 10 \sin x$.

(b) Do #32 on page 338.

6. Consider the differential equation

$$ay'' + by' + cy = g(t)$$

where $a > 0$, $c > 0$, and $g(t)$ is a continuous function on \mathbb{R} .

(a) If $y(t)$ is a solution of the above equation with $b > 0$ and $g(t) \equiv 0$, show that $\lim_{t \rightarrow \infty} y(t) = 0$.

(b) Is the result in (a) true, if $b = 0$?

(c) If $g(t) \equiv d$ and $b > 0$, show that $\lim_{t \rightarrow \infty} y(t) = \frac{d}{c}$ for every solution $y(t)$ to the above equation.