

Homework 7 (MATH 2310-04)
Due date: Thursday, April 3, 2014

Name (Print):

1. Consider the following differential equation.

$$2y'' - 4y' - 6y = 6e^{2t}.$$

- Use the method of undetermined coefficients to find the general solution.
- Calculate the solution for the case that $y(0) = 0$ and $y'(0) = 0$.
- Explain the behavior of this specified solution as t increases.

Solution :

- $y(t) = c_1 e^{3t} + c_2 e^{-t} - e^{2t}$
- $y(t) = (3/4) e^{3t} + (1/4) e^{-t} - e^{2t}$
- $y(t) = (3/4) e^{3t}$ as $t \rightarrow \infty$.

2. Consider the following differential equation.

$$y'' - 2y' - 3y = -3te^{-t}.$$

- Use the method of variation of parameters to find the general solution for this equation.
- Calculate the solution for the case that $y(0) = 0$ and $y'(0) = 1$.
- Explain the behavior of the specific solution as t increases.

Solution :

- $y(t) = c_1 e^{3t} + c_2 e^{-t} + (3/16) t e^{-t} + (3/8) t^2 e^{-t}$
- $y(t) = (13/64) e^{3t} - (13/64) e^{-t} + (3/16) t e^{-t} + (3/8) t^2 e^{-t}$
- $y(t) = (13/64) e^{3t}$ as $t \rightarrow \infty$.

3. Consider the following differential equation.

$$4y'' - 4y' + y = 16e^{t/2}.$$

- Use the characteristic equation to find one solution of the homogeneous equation.
- Use the method of reduction of order to find the general solution of the homogeneous equation.
- Use the method of variation of parameters to find the general solution of the inhomogeneous equation.

Solution :

- $y_1(t) = e^{t/2}$
- $y_h(t) = (c_1 t + c_2) e^{t/2}$
- $y(t) = (2t^2 + c_1 t + c_2) e^{t/2}$