Math 340 Professor Carlson
Homework 5

Section 3.1

1. Looking for solutions of the form $y = e^{rt}$ in the equation

$$y'' + 2y' - 3y = 0$$

we obtain

$$r^2 + 2r - 3 = 0, \quad r = -3, 1.$$

The general solution is

$$y(t) = c_1 e^{-3t} + c_2 e^t.$$

2. Looking for solutions of the form $y = e^{rt}$ in the equation

$$y'' + 3y' + 2y = 0$$

we obtain

$$r^2 + 3r + 2 = 0, \quad r = -2, -1.$$

The general solution is

$$y(t) = c_1 e^{-t} + c_2 e^{-2t}.$$

3. Looking for solutions of the form $y = e^{rt}$ in the equation

$$6y'' - y' - y = 0$$

we obtain

$$6r^2 - r - 1 = (3r + 1)(2r - 1) = 0, \quad r = -1/3, 1/2.$$

The general solution is

$$y(t) = c_1 e^{-t/3} + c_2 e^{t/2}.$$

4. Looking for solutions of the form $y = e^{rt}$ in the equation

$$y'' + 5y' = 0$$

we obtain

$$r^2 + 5r, \quad r = 0, -5.$$

The general solution is

$$y(t) = c_1 + c_2 e^{-5t}.$$

7. Looking for solutions of the form $y = e^{rt}$ in the equation

$$y'' + y' - 2y = 0, \quad y(0) = 1, \quad y'(0) = 1$$

we obtain

$$r^2 + r - 2 = 0, \quad r = -2, 1.$$

The general solution is

$$y(t) = c_1 e^{-2t} + c_2 e^t.$$

To satisfy the initial conditions we need

$$c_1 + c_2 = 1, \quad -2c_1 + c_2 = 1,$$

so

$$c_1 = 0, \quad c_2 = 1.$$

The specific solution is $y(t) = e^t$.

9. Looking for solutions of the form $y = e^{rt}$ in the equation

$$y'' + 3y' = 0, \quad y(0) = -2, \quad y'(0) = 3$$

we obtain

$$r^2 + 3r = 0, \quad r = 0, -3.$$

The general solution is

$$y(t) = c_1 + c_2 e^{-3t}.$$

To satisfy the initial conditions we need

$$c_1 + c_2 = -2, \quad -3c_2 = 3,$$

so

$$c_1 = -1, \quad c_2 = -1.$$

The specific solution is $y(t) = -1 - e^{-3t}$.