Review

1. Solve the differential equations

$$x^2y'' + 3xy' + 5y = 0,$$
$$x^2y'' - 3xy' + 4y = 0.$$

2. Solve the initial value problems

$$x^2y'' + 6xy' + 6y = 0, \quad y(1) = 1, y'(1) = 3,$$
$$x^2y'' + 4xy' + 2y = 0, \quad y(1) = 3, y'(1) = -1.$$

3. For each of the following initial value problems find $y'''(0)$:

$$y'' + xy' + y = 0, \quad y(0) = 1, y'(0) = 0,$$
$$y'' + 4y' + 6xy = 0, \quad y(0) = -1, y'(0) = 1.$$

4. Using the method of the Laplace transform, solve the following initial value problems

$$y'' + 6y' + 9y = t, \quad y(0) = 2, y'(0) = -1,$$
$$y'' + y = \cos t, \quad y(0) = -1, y'(0) = 2,$$
$$y'' + 4y' + 5y = \begin{cases} \sin t & t < \pi, \\ \cos t & t \geq \pi \end{cases}, \quad y(0) = 0, y'(0) = 1,$$
$$y'' + 4y = \begin{cases} t & t < 1, \\ 0 & t \geq 1 \end{cases}, \quad y(0) = -1, y'(0) = 0,$$
$$y''' + 3y'' + 3y' + y = t^2, \quad y(0) = y'(0) = 1, y''(0) = 2,$$
$$y''' + y'' - y' - y = 1, \quad y(0) = y'(0) = 0, y''(0) = -1.$$