1. Find the general solution of the differential equations.
   
   (a) $4y'' + 4y' + y = 0$

   (b) $2y'' + 3y' = 0$

2. (a) Find the general solution of the differential equation

   $y''' + 3y'' - 54y = 0,$

   given that $y_1(x) = e^{3x}$ is one particular solution of the differential equation.
(b) Solve the initial value problem

\[ 2y''' - 3y'' - 2y' = 0, \quad y(0) = 1, \quad y'(0) = -1, \quad y''(0) = 3. \]

3. Use the method of variation of parameters to find a particular solution of

\[ y'' - 4y = xe^x. \]

4. Solve the initial value problem

\[ y^{(4)} - 4y'' = x^2, \quad y(0) = y'(0) = 1, \quad y''(0) = y'''(0) = -1. \]
5. (a) Let $y_1(x)$ and $y_2(x)$ be two linearly independent solutions of the differential equation

$$y'' + p(x)y' + q(x)y = f_1(x).$$

Is $y(x) = c_1y_1(x) + c_2y_2(x)$ a general solution of this equation?

(b) Let $y_1(x)$ be a particular solution of the equation

$$y'' + p(x)y' + q(x)y = f_1(x)$$

and $y_2(x)$ be a particular solution of the equation

$$y'' + p(x)y' + q(x)y = f_2(x).$$

Prove or disprove that $y(x) = y_1(x) + y_2(x)$ is a solution of

$$y'' + p(x)y' + q(x)y = f_1(x) + f_2(x).$$