Consider the initial value problem

\[ y'' - \frac{1}{t} y' - \frac{3}{t^2} y = 0, \quad y(1) = 4, \quad y'(1) = 8, \quad 0 < t < \infty. \]

(a) Show that \( y_1(t) = t^3 \) and \( y_2(t) = t^{-1} \) are solutions to the differential equation.

(b) Show that \( \{y_1, y_2\} \) is a fundamental set of solutions to the differential equation.

(c) Solve the given initial value problem.
Exercise 2.

Solve: \(y'' - 5y' - 6y = 0\).
Exercise 3.

Solve the initial value problem

\[ y'' - 10y' + 29y = 0, \quad y(0) = 1, \quad y'(0) = 3. \]
Exercise 4.

Find a homogeneous linear ordinary differential equation whose general solution is $y(t) = c_1 e^{2t} \cos(3t) + c_2 e^{2t} \sin(3t)$. 
For exercises 5-6-7, use the method of Undermined Coefficients to find a particular solution and solve the given DE.

**Exercise 5.**

Find the general solution of the nonhomogeneous equation

\[ y'' - 2y' - 3y = 36e^{5t}. \]
Exercise 6.

Find the general solution of

\[ y'' - y' + y = 2 \sin 3t. \]
Exercise 7.

Find the general solution of

\[ y'' + 4y' - 2y = 2t^2 - 3t + 6. \]
For Exercises 8-9, use the method of Variation of Parameters to solve the given DE.

**Exercise 8.**

Find the general solution of

\[ y'' - y' - 2y = 2e^{-t} \]

using the method of variation of parameters.
Exercise 9.

Find the general solution to $(2t - 1)y'' - 4ty' + 4y = (2t - 1)^2 e^{-t}$ if $y_1(t) = t$ and $y_2(t) = e^{2t}$ form a fundamental set of solutions to the equation.