1. Consider the equation
\[ t^2 y'' - 2y = 0. \]
(a) Verify that both \( y_1(t) = t^2 \) and \( y_2(t) = 1/t \) are solutions. On what interval(s) are both \( y_1 \) and \( y_2 \) solutions?
(b) Find the Wronskian \( W(y_1, y_2)(t) \) and determine on what interval(s) \( W \) is nonzero.
(c) Find the solution \( y = \phi(t) \) that satisfies the initial conditions
\[ y(-1) = -1, \quad y'(-1) = -4, \]
and determine the open interval on which the solution is defined. What does Theorem 3.2.1 (page 146) say about \( \phi(t) \)?

2. (a) Find the general solution of: \( y'' + 3y' + y = 0 \).
(b) Find the general solution of: \( y'' + \omega^2 y = 0 \), where \( \omega > 0 \) is a constant.
(c) Solve the IVP: \( y'' + 2y' + 2y = 0, \quad y(0) = 1, \quad y'(0) = -1 \).

3. (a) Verify that \( y_1(t) = t^{-1} \cos(2 \ln t) \) and \( y_2(t) = t^{-1} \sin(2 \ln t) \) are both solutions of
\[ y'' + \frac{3}{t} y' + \frac{5}{t^2} y = 0, \quad t > 0, \]
and show that they form a fundamental set of solutions for the differential equation.
(b) Solve the initial value problem
\[ y'' + \frac{3}{t} y' + \frac{5}{t^2} y = 0, \quad y(1) = 1, \quad y'(1) = 0. \]