1. Chapter 1.1 - Page 8, Problem 11
Verify by substitution that each given function is a solution of the given differential equation.

\[ x^2 y'' + 5xy' + 4y = 0; \quad y_1 = \frac{1}{x^2}, \quad y_2 = \frac{\ln x}{x^2} \]

2. Chapter 1.1 - Page 8, Problem 26
First verify that \( y(x) \) satisfies the given differential equation. Then determine a value of the constant \( C \) so that \( y(x) \) satisfies the given initial condition.

\[ y' + y \tan x = \cos x; \quad y(x) = (x + C)\cos x, \quad y(\pi) = 0 \]

3. Chapter 1.2 - Page 16, Problem 10
Find a function \( y = f(x) \) satisfying the given differential equation and the prescribed initial condition.

\[ \frac{dy}{dx} = xe^{-x}; \quad y(0) = 1 \]

4. Chapter 1.2 - Page 16, Problem 17
Find the position function \( x(t) \) of a moving particle with the given acceleration \( a(t) \), initial position \( x_0 = x(0) \), and initial velocity \( v_0 = v(0) \).

\[ a(t) = \frac{1}{(t + 1)^3}, \quad v_0 = 0, \quad x_0 = 0 \]

5. Chapter 1.2 - Page 17, Problem 27
A ball is thrown straight downward from the top of a tall building. The initial speed of the ball is 10 m/s. It strikes the ground with a speed of 60 m/s. How tall is the building?