1. (8 pts) Use the method of Reduction of Order to find a second linearly independent solution \( y_2 \) of the differential equation \( x^2 y'' + 2xy' - 6y = 0 \) given a known solution of \( y_1 = x^2 \).

2. (8 pts) Find the general solution of the differential equation \( y'' + 4y' - 2y = 0 \).

3. (8 pts) Find the general solution of the differential equation \( y'' - 4y' + 29y = 0 \).

4. (14 pts) Solve the initial-value problem \( y'' + 6y' + 9y = 0, \quad y(0) = -3, \quad y'(0) = 1 \).

5. (14 pts) Find the general solution of the differential equation \( y'' - 2y' - 8y = 2 - x^2 \).

6. (14 pts) Find the general solution of the differential equation \( y'' - y = -6e^x \).

7. (8 pts) Find the general solution of the differential equation \( x^2 y'' + 5xy' + 3y = 0 \).

8. (8 pts) Find the general solution of the differential equation \( x^2 y'' - 3xy' + 13y = 0 \).

9. (14 pts) Use the method of Variation of Parameters to find a particular solution of \( x^2 y'' - 2xy' + 2y = \ln x \).

10. (10 pts) A mass weighing 6 lbs is attached to a 4 ft spring and stretches the spring so that its new length is 7 ft. This mass is replaced by another mass which weighs 8 lbs. The mass is released at a point \( \frac{1}{2} \) ft below the equilibrium position with an initial downward velocity of 1 ft/s. Find the equation of motion.