1. Solve $2y^2 + ye^{xy} + (4xy + xe^{xy} + 2y)y' = 0$ (15%)

2. Find the general solution of $y'' - 4y = x + e^{2x}$ (15%)

3. Solve the initial value problem   (15%)

$$y'' + 4y = f(t) \quad y(0) = 1 \quad y'(0) = 0$$

$$f(t) = \begin{cases} 0 & 0 \le t < 4 \\ 3 & t \ge 4 \end{cases}$$

4. Find the equation of a plane containing three points of P : (-1,4,2), Q : (6,-2,8), and R : (5,-1,-1)   (15%)

5. Find the general solution of the system or show that it is inconsistent.   (20%)

$$2X_1 - 3X_3 = 1$$

$$X_1 - X_2 + X_3 = 1$$

$$2X_1 - 4X_2 + X_3 = 0$$

6. Find the eigenvalues of the matrix. For each eigenvalue, find an eigenvector. (20%)

$$\begin{pmatrix} 2 & 0 & 0 \\ 1 & 0 & 2 \\ 0 & 0 & 3 \end{pmatrix}$$