

1. Solve the Bernoulli Equation (20%)

$$y' + 2xy = xy^2$$

2. For the matrix A

$$A = \begin{bmatrix} 2 & 1 & 2 \\ 4 & 2 & 4 \\ 2 & 1 & 2 \end{bmatrix}$$

Find the eigenvalues(特徵值) and the corresponding eigenvectors (特徵向量) of A. (20%)

3. Solve the ODE (Using the Integrating Factor) (20%)

$$(y + xy)dx + x dy = 0$$

4. The equation is

$$y'' - 3y' + 2y = 6x$$

Find the general solution of the equation. (20%)

5. Use the Laplace transform (拉普拉斯轉換) to find the solution. (20%)

$$y'' - y = t \quad ; \quad y(0) = y'(0) = 2$$