Assignment 1 - Mathematics-I
Departments: ECE,CSE,ENE, Pondicherry University

Aasaimani Thamizhazhagan
aasaimanit@pondiuni.ac.in

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1. Determine whether each of the following sets of vectors is linearly independent. If not, find the linear combination relationship among them.

   (a) $X_1 = (1, -1, 2, -3),\ X_2 = (4, 1, 0, 2),\ X_3 = (0, 3, 1, 4),\ X_4 = (0, 1, 0, 2)$

   (b) $X_1 = (1, -2, -3, -2, 1),\ X_2 = (3, -2, 0, -1, -7),\ X_3 = (0, 1, 2, 1, -6),\ X_4 = (0, 2, 2, 1, -5)$

   (c) $X_1 = (0, 1, -3, -1),\ X_2 = (1, 0, 1, 1),\ X_3 = (3, 1, 0, 2),\ X_4 = (1, 1, -2, 0)$

2. Solve

   (a) $x + y + z - w = 3; \quad x + 2y + 3z + w = 1; \quad 3x + 4y + 5z - w = 7$

   (b) $x + 2y + 3z = 6; \quad 2x - 3y + 5z = 4; 2x + 4y - z = 5; \quad 4x + 2y - 3z = 3$

3. Investigate for what values of λ, μ, the equations

$$x - 2y + 2z = 4; \quad 4x - 3y - 8z = 18; \quad 8x - 6y + \lambda z = \mu$$

   have (a) no solution, (b) a unique solution, (c) infinitely many solutions.

4. Find the values of λ for which equations

$$x+(\lambda+1)y+(2\lambda-1)z = 0; \quad 3x+(5\lambda+2)y+(7\lambda-8)z = 0; \quad 2x+(\lambda+3)y+(5\lambda-3)z = 0$$

   possess a non-trivial solution. For each of these values of λ, find the solution for the corresponding system of linear equations also.