DEPARTMENT OF MATHEMATICS, IIT DELHI
SEMESTER II 2024 − 25
MTL 101 (Linear Algebra and Differential Equations) - Quiz 1

Date: 29/01/2025 (Wednesday) Time: 6:30 PM - 7:15 PM.

"As a student of IIT Delhi, I will not give or receive aid in examinations. I will do my share and take an active part in seeing to it that others as well as myself uphold the spirit and letter of the Honour Code."

Name : BLOCK LETTER ONLY

Entry Number: **Group:**

Gradescope Id: **Lecture Hall:**

Question 1: Using RRE method of finding the inverse, determine all values of a and b for which the matrix A is invertible and compute the inverse for $b = -1$:

$$A = \begin{pmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & a & 1 & 1 \\ 2 & 0 & 0 & b \end{pmatrix}$$

[4]

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Question 2: Using elementary row operations find for what values of a, the following system has i) no solution, ii) a unique solution and iii) infinite number of solutions.

$$\begin{aligned} x + y + z &= 3 \\ 2x + 5y + 4z &= a \\ 3x + (a^2 - 8)z &= 12 \end{aligned}$$

[5]

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Question 3: (a) Let V be a real vector space and $\{v_1, v_2, v_3\}$ be a set of linearly independent vectors in V. Show that the set $\{v_1+v_3, 3v_1+2v_2+v_3, 2v_1+3v_2+v_3\}$ is linearly independent in V. [3]

(b) Consider the real vector space

$$\mathbb{R}^4 = \{(x_1, x_2, x_3, x_4) : x_i \in \mathbb{R}, 1 \leq i \leq 4\}.$$

Is

$$W = \{(x_1, x_2, x_3, x_4) \in \mathbb{R}^4 : x_4 \in \mathbb{Z}\}$$

a subspace of $\mathbb{R}^4(\mathbb{R})$? Justify. [1]

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