Department of Mathematics and Natural Sciences

MAT216: Linear Algebra & Fourier Analysis

Spring 2025

Summer 2023

ASSIGNMENT 1

Faculty Name: Shovan Sourav Datta (SVP) Mark: 50

*Make a **Front Page** by yourself, mentioning your #name, #ID, and #section. (Compulsory)*

1. Describe the row picture of a system of linear equations with

   (a) 2 unknowns and 2 equations. (2) (b) 3 unknowns and 3 equations. (3)

2. In each part determine whether the matrix is in row-echelon form, reduced row-echelon form, both, or neither. (State the reason) (10 × 1 = 10)

   (a) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 0 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & 2 & 4 \\ 0 & 0 & 0 \end{bmatrix}$ (e) $\begin{bmatrix} 0 & b & 0 \\ 0 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

   (f) $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$ (g) $\begin{bmatrix} 0 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$ (h) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ (i) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ (j) $\begin{bmatrix} a & b & 0 \\ 0 & 0 & c \\ 0 & 0 & 0 \end{bmatrix}$

   $\begin{bmatrix} 0 & b & 0 & 0 & 0 & c \\ 0 & 0 & 0 & 0 & 0 & 0 \end{bmatrix}$

3. Solve the following system of equations using reduced row echelon form. (5 × 3 = 15)

   (a) $x_1 + 6x_3 = 12$, $3x_1 + x_2 - x_3 = -2$, $-7x_2 - 4x_3 = 2$, $2x_1 + 4x_2 = 0$

   (b) $2x_1 + x_2 + 12x_3 = 1$, $-3x_1 - 2x_2 + x_3 = 15$, $5x_1 + 3x_2 + 2x_3 = 0$, $3x_1 + x_2 + 3x_3 = 11$, $-6x_1 - 4x_2 + 2x_3 = 30$

   (c) $x_1 + 2x_2 + 9x_3 = -1$

4. Solve the following system of equations using inverse matrix technique. (Calculate the inverse matrix using row operation) (5 × 2 = 10)

   (a) $2x_1 + 3x_2 + 2x_3 = 1$, $2x_1 + 2x_2 + 3x_3 = 1$, $x_1 + 3x_3 = 1$

   (b) $x_2 + 2x_3 = 12$, $-3x_2 - 4x_3 = 13$, $x_1 + 4x_3 = 11$

5. What is Elementary Matrix and Permutation Matrix? Write down any 8 random **Elementary Matrix**. (2 + 1 × 8 = 10)