MATH 2111: Tutorial 1 Linear System and Echelon Form

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Review

- Linear equation & Linear systems
- Matrix & Augumented matrix
- Elemantary Row Operations & Row Equivalent
- Echelon Form & Reduced Echelon Form

Example 1

Can a linear system has finite many solutions, like 2 solutions, or 100 solutions?

Example 2

Solve the following linear system with Echelon form

$$\begin{cases} x_1 - x_2 + x_3 = 2, \\ x_1 + 2x_2 = 1, \\ x_1 - x_3 = 4. \end{cases} \tag{1}$$

Example 3

Solve the following linear system with Echelon form

$$\begin{cases} x + y + z = 0, \\ 2x - 6y + 6z = 2, \\ 4x + 8y + 2z = 4. \end{cases} \tag{2}$$

Example 4

Solve the following linear system:

$$\begin{cases} a_{11}x_1 + a_{12}x_2 = b_1, \\ a_{21}x_1 + a_{22}x_2 = b_2, \end{cases} \tag{3}$$

where $a_{11} \neq 0$.

Hint

Need to discuss different cases: inconsisten case, only one solution and infinite many solutions case.

Example 5

Suppose $\begin{pmatrix} 1 & 1 & 1 & 0 \\ 2 & -1 & -1 & 3 \\ 1 & a & b & 4 \end{pmatrix}$ is an augumented matrix. Determine a and b such that the linear system

(1) is inconsistent,

(2) has a unique solution,

(3) has infinite many solutions.