Lecture 26: Linear System of Equations (03/25/26)

Methods to solve:

1. Substitution
2. Elimination

Example

$$\begin{cases} x + y + z = 1 \\ 2x + 3y + z = 2 \\ x + 4y - 3z = 3 \end{cases}$$

1) Using Substitution

$$z = 2 - 2x - 3y$$

Substitute into equations:

$$-3x - 5y = -3$$

$$7x + 13y = 9$$

$$x = 1 - \frac{5}{2}y$$

$$7\left(1 - \frac{5}{2}y\right) + 13y = 9$$

$$y = \frac{3}{2}$$

$$x = -\frac{3}{2}$$

$$z = \frac{1}{2}$$

Solution

$$x = -\frac{3}{2}, \quad y = \frac{3}{2}, \quad z = \frac{1}{2}$$

2) Using Elimination

$$(1) - (2) :$$

$$-3x - 5y = -3$$

$$3(2) + (3) :$$

$$7x + 13y = 9$$

Same system as substitution.

Matrix Representation

$$\begin{bmatrix} 1 & 1 & 1 \\ 2 & 3 & 1 \\ 1 & 4 & -3 \end{bmatrix}$$

Augmented matrix associated to the linear system.