5.2.49

EE25BTECH11047 - RAVULA SHASHANK REDDY

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Question:

Solve the system of equations using matrices:

$$\begin{aligned} 3x - y - 2z &= 2, \\ 2y - z &= -1, \\ 3x - 5y &= 3. \end{aligned}$$

Solution:

Given:

$$\begin{pmatrix} 3 \\ -1 \\ -2 \end{pmatrix}^T \mathbf{x} = 2, \tag{1}$$

$$\begin{pmatrix} 0 \\ 2 \\ -1 \end{pmatrix}^T \mathbf{x} = -1, \tag{2}$$

$$\begin{pmatrix} 3 \\ -5 \\ 0 \end{pmatrix}^T \mathbf{x} = 3 \tag{3}$$

$$\begin{pmatrix} 3 & -1 & -2 \\ 0 & 2 & -1 \\ 3 & -5 & 0 \end{pmatrix} \mathbf{x} = \begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix} \tag{4}$$

$$R_3 \to R_3 - R_1 \Rightarrow \begin{pmatrix} 3 & -1 & -2 & 2 \\ 0 & 2 & -1 & -1 \\ 0 & -4 & 2 & 1 \end{pmatrix} \tag{5}$$

$$R_2 \to \tfrac{1}{2} R_2 \Rightarrow \begin{pmatrix} 3 & -1 & -2 & 2 \\ 0 & 1 & -\frac{1}{2} & -\frac{1}{2} \\ 0 & -4 & 2 & 1 \end{pmatrix} \tag{6}$$

$$R_1 \to R_1 + R_2, \quad R_3 \to R_3 + 4R_2 \Rightarrow \begin{pmatrix} 3 & 0 & -\frac{5}{2} & \frac{3}{2} \\ 0 & 1 & -\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & 0 & -1 \end{pmatrix} \tag{7}$$

$$\Longrightarrow \; 0 = -1 \tag{8}$$

System inconsistent $\Rightarrow$ $\boxed{\text{No solution}}$

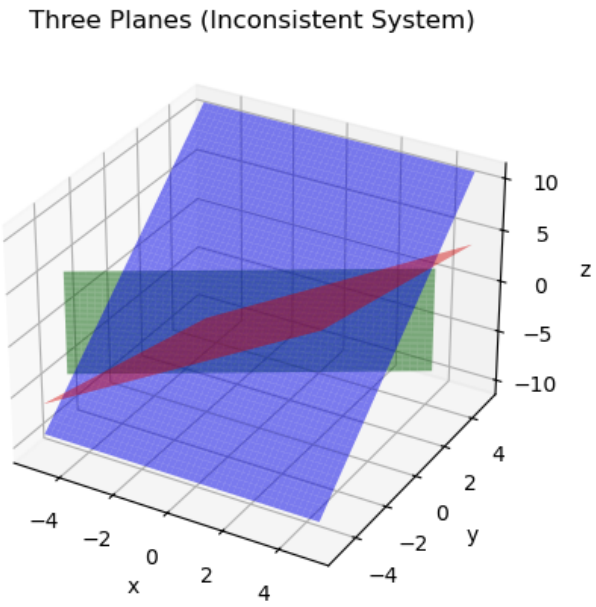

Figure 1