Assignment 3

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***Abstract*—This document examines the consistency of the system of equations.**

1 Problem

Examine the consistency of the system of given equations:

$$3x - y - 2z = 2 \tag{1.1}$$

$$2y - z = -1 \tag{1.2}$$

$$3x - 5y = 3 \tag{1.3}$$

2 Solution

The given system of equations can be represented as:

$$\mathbf{Ax} = \mathbf{B} \tag{2.1}$$

Coefficient Matrix **A**

$$\mathbf{A} = \begin{pmatrix} 3 & -1 & -2 \\ 0 & 2 & -1 \\ 3 & -5 & 0 \end{pmatrix} \tag{2.2}$$

Constant Vector **B**

$$\mathbf{B} = \begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix} \tag{2.3}$$

Augumented Matrix-

$$\mathbf{A|B} = \left(\begin{array}{ccc|c} 3 & -1 & -2 & 2 \\ 0 & 2 & -1 & -1 \\ 3 & -5 & 0 & 3 \end{array}\right) \tag{2.4}$$

Applying Row operations on (2.4)

$$\left(\begin{array}{ccc|c} 3 & -1 & -2 & 2 \\ 0 & 2 & -1 & -1 \\ 3 & -5 & 0 & 3 \end{array}\right) \xleftrightarrow{R3 \to R1 - R3} \left(\begin{array}{ccc|c} 3 & -1 & -2 & 2 \\ 0 & 2 & -1 & -1 \\ 0 & 4 & -2 & -1 \end{array}\right) \tag{2.5}$$

$$\left(\begin{array}{ccc|c} 3 & -1 & -2 & 2 \\ 0 & 2 & -1 & -1 \\ 0 & 4 & -2 & -1 \end{array}\right) \xleftrightarrow{R3 \to R3 - R2} \left(\begin{array}{ccc|c} 3 & -1 & -2 & 2 \\ 0 & 2 & -1 & -1 \\ 0 & 0 & 0 & 1 \end{array}\right) \tag{2.6}$$

$$\mathbf{A|B} = \left(\begin{array}{ccc|c} 3 & -1 & -2 & 2 \\ 0 & 2 & -1 & -1 \\ 0 & 0 & 0 & 1 \end{array}\right) \mathbf{A} = \begin{pmatrix} 3 & -1 & -2 \\ 0 & 2 & -1 \\ 0 & 0 & 0 \end{pmatrix} \tag{2.7}$$

$$R(\mathbf{A|B}) = 3 \tag{2.8}$$

$$R(\mathbf{A} = 2 \tag{2.9}$$

$$R(\mathbf{A|B}) \neq R(\mathbf{A}) \tag{2.10}$$

The given system of equations are inconsistent