

ASSIGNMENT 2

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

Download all python codes from

https://github.com/EE20MTECH14019/EE5609/tree/master/Assignment_2/Codes

and latex-tikz codes from

https://github.com/EE20MTECH14019/EE5609/tree/master/Assignment_2

Hence (1.0.1) is consistent and has unique solution $\begin{pmatrix} 3 \\ 1 \end{pmatrix}$

1 PROBLEM

Examine the consistency of the system of the following equations

$$\begin{aligned} 2x - y &= 5 \\ x + y &= 4 \end{aligned} \quad (1.0.1)$$

2 SOLUTION

The given system of equations (1.0.1) can be written the matrix equation form as

$$\mathbf{Ax} = \mathbf{b} \quad (2.0.1)$$

$$\Rightarrow \begin{pmatrix} 2 & -1 \\ 1 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 5 \\ 4 \end{pmatrix} \quad (2.0.2)$$

The augmented matrix for (2.0.2) is row reduced as follows

$$\begin{pmatrix} 2 & -1 & 5 \\ 1 & 1 & 4 \end{pmatrix} \quad (2.0.3)$$

$$\xleftrightarrow{R_2 \leftarrow \frac{2R_2 - R_1}{3}} \begin{pmatrix} 2 & -1 & 5 \\ 0 & 1 & 1 \end{pmatrix} \quad (2.0.4)$$

$$\xleftrightarrow{R_1 \leftarrow \frac{R_1 + R_2}{2}} \begin{pmatrix} 1 & 0 & 3 \\ 0 & 1 & 1 \end{pmatrix} \quad (2.0.5)$$

$$\Rightarrow \text{Rank} \begin{pmatrix} 2 & -1 \\ 1 & 1 \end{pmatrix} = \text{Rank} \begin{pmatrix} 2 & -1 & 5 \\ 1 & 1 & 4 \end{pmatrix} \quad (2.0.6)$$

$$= 1 < \dim \begin{pmatrix} 2 & -1 \\ 1 & 1 \end{pmatrix} \quad (2.0.7)$$

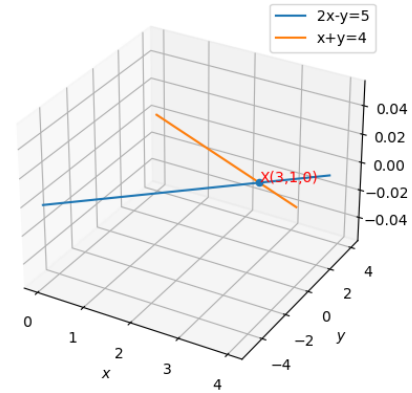


Fig. 0: Intersection of lines $2x - y = 5$ and $x + y = 4$