Matrix Theory Assignment 2

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***Abstract*—This document contains the solution to problem No.3.10.52**

1 Problem Statement

Examine the consistency of the system of given Equation.

$$x + 2y = 2 \tag{1.0.1}$$
$$2x + 3y = 3 \tag{1.0.2}$$

2 Solution

The given system of equations can be written in the form of **AX=B** where,

$$A = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix} \tag{2.0.1}$$
$$X = \begin{bmatrix} x \\ y \end{bmatrix} \tag{2.0.2}$$
$$B = \begin{bmatrix} 2 \\ 3 \end{bmatrix} \tag{2.0.3}$$
$$\implies AX = B \tag{2.0.4}$$
$$\implies A^{-1}AX = A^{-1}B \tag{2.0.5}$$
$$\because A^{-1}A = I \tag{2.0.6}$$
$$\implies X = A^{-1}B \tag{2.0.7}$$

Therefore if A^{-1} exists, we will have a unique solution for these linear equations.
Now,

$$A^{-1} = \frac{1}{\left|A\right|} adj(A) \tag{2.0.8}$$

So, $\left|A\right|$ should not be **zero** for having a unique solution.

$$\left|A\right| \neq \begin{vmatrix} 1 & 2 \\ 2 & 3 \end{vmatrix} \tag{2.0.9}$$
$$\left|A\right| = 3 \times 1 - 3 \times 2 = 3 - 4 = -1 \tag{2.0.10}$$
$$\implies \left|A\right| = -1 \neq 0 \tag{2.0.11}$$
$$\because \left|A\right| \neq 0 \tag{2.0.12}$$

So the System of equation is **Consistent**.
Python Code:

https://github.com/ayushkesh/Matrix−Theory−EE5609/blob/master/A2/codes/A2.ipynb

Latex codes:

https://github.com/ayushkesh/Matrix−Theory−EE5609/blob/master/A2/latex/A2.tex