# ASSIGNMENT 1

NSV SARATH CHANDRA(CC20MTECH14001)

## 1 Problem

Check which of the following are solutions of the following equation:

$$\begin{pmatrix}1-2\end{pmatrix}x = 4 \tag{1.0.1}$$

## 2 Explanation

A point C lying on the line

$$\begin{pmatrix}a & b\end{pmatrix}x = d \tag{2.0.1}$$

At any distance $\lambda$ from point x lying on the same line is given as

$$c = x + \frac{\lambda}{\sqrt{a^2+b^2}}\begin{pmatrix}b\\-a\end{pmatrix} \tag{2.0.2}$$

We have $\lambda = \sqrt{a^2+b^2} \implies c = x + \begin{pmatrix}b\\-a\end{pmatrix}$

## 3 Solution

Equation of y axis is

$$\begin{pmatrix}1 & 0\end{pmatrix}x = 0 \tag{3.0.1}$$

For $\begin{pmatrix}1 & -2\end{pmatrix}x = 4$ (at y axis meet)

$$\begin{pmatrix}1 & -2\\1 & 0\end{pmatrix}y_1 = \begin{pmatrix}4\\0\end{pmatrix} \tag{3.0.2}$$

$$\mathbf{y_1} = \begin{pmatrix}1 & -2\\1 & 0\end{pmatrix}^{-1}\begin{pmatrix}4\\0\end{pmatrix} \tag{3.0.3}$$

$$\mathbf{y_1} = \begin{pmatrix}0\\-2\end{pmatrix} \tag{3.0.4}$$

Another point $c_1$ on the line is found using

$$\mathbf{c_1} = y_1 + \begin{pmatrix}-2\\-1\end{pmatrix} \tag{3.0.5}$$

$$= \begin{pmatrix}0\\-2\end{pmatrix} + \begin{pmatrix}-2\\-1\end{pmatrix} = \begin{pmatrix}-2\\-3\end{pmatrix} \tag{3.0.6}$$

Equation for x axis is $\begin{pmatrix}1 & 0\end{pmatrix}y = 0$

$$\begin{pmatrix}1 & -2\\0 & 1\end{pmatrix}y = \begin{pmatrix}4\\0\end{pmatrix} \tag{3.0.7}$$

$$\mathbf{y} = \begin{pmatrix}1 & -2\\0 & 1\end{pmatrix}^{-1}\begin{pmatrix}4\\0\end{pmatrix} \tag{3.0.8}$$

$$\mathbf{y} = \begin{pmatrix}4\\0\end{pmatrix} \tag{3.0.9}$$

## 4 Checking for Additional Solutions

1) For $\mathbf{x} = \begin{pmatrix}0\\2\end{pmatrix}$, we have
$\begin{pmatrix}1 & -2\end{pmatrix}x = 1*0 + -2*2 = -4! = 4$
Hence not a solution.

2) For $\mathbf{x} = \begin{pmatrix}2\\0\end{pmatrix}$, we have
$\begin{pmatrix}1 & -2\end{pmatrix}x = 1*2 + -2*0 = 2! = 4$
Hence not a solution.

3) For $\mathbf{x} = \begin{pmatrix}1\\1\end{pmatrix}$, we have
$\begin{pmatrix}1 & -2\end{pmatrix}x = 1*1 + -2*1 = -1! = 4$
Hence not a solution.

4) For $\mathbf{x} = \begin{pmatrix}\sqrt{2}\\4\sqrt{2}\end{pmatrix}$, we have
$\begin{pmatrix}1 & -2\end{pmatrix}x = 1*\sqrt{2} + -2*4\sqrt{2} = -7\sqrt{2}! = 4$
Hence not a solution.

Therefore, solution is only $\begin{pmatrix}4\\0\end{pmatrix}$