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# **ASSIGNMENT 1**

## NSV SARATH CHANDRA(CC20MTECH14001)

## 1 Problem

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

$$(1-2)x = 4 (1.0.1)$$

### 2 EXPLANATION

A point C lying on the line

$$(a \quad b) x = d$$
 (2.0.1)

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

$$c = x + \frac{\lambda}{\sqrt{a^2 + b^2}} \binom{b}{-a}$$
 (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)

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

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

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

Another point  $c_1$  on the line is found using

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

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

Equation for x axis is  $(1 \ 0)y = 0$ 

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

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

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

4 CHECKING FOR ADDITIONAL SOLUTIONS

1) For 
$$x = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$$
, we have  $\begin{pmatrix} 1 & -2 \end{pmatrix} x = 1 * 0 + -2 * 2 = -4! = 4$ 

Hence not a solution.

2) For 
$$x = \begin{pmatrix} 2 \\ 0 \end{pmatrix}$$
, we have  $\begin{pmatrix} 1 & -2 \end{pmatrix} x = 1 * 2 + -2 * 0 = 2! = 4$ 

Hence not a solution.

3) For 
$$x = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$$
, we have  $\begin{pmatrix} 1 & -2 \end{pmatrix} x = 1 * 1 + -2 * 1 = -1! = 4$ 

Hence not a solution.

4) For 
$$x = \begin{pmatrix} \sqrt{2} \\ 4\sqrt{2} \end{pmatrix}$$
, we have  $(1 -2)x = 1 * \sqrt{2} + -2 * 4\sqrt{2} = -7\sqrt{2}! = 4$ 

Hence not a solution.

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