4.3.12

EE25BTECH11025 - Ganachari Vishwambhar

Question:
Check which of the following are solutions of the equation $x - 2y = 4$ and which are not

1) $(0, 2)$
2) $(2, 0)$
3) $(4, 0)$
4) $\left(\sqrt{2}, 4\sqrt{2}\right)$
5) $(1, 1)$

Solution:

Given line equation can be written as:

$$\mathbf{n}^\top \mathbf{x} = c \tag{1}$$

where $\mathbf{n} = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$, $\mathbf{x} = \begin{pmatrix} x \\ y \end{pmatrix}$ and $c = 4$.

Checking whether a point lies on the line or not by substituting given vectors in (1):

$$\mathbf{x}_1 = \begin{pmatrix} 0 \\ 2 \end{pmatrix}, \mathbf{x}_2 = \begin{pmatrix} 2 \\ 0 \end{pmatrix}, \mathbf{x}_3 = \begin{pmatrix} 4 \\ 0 \end{pmatrix}, \mathbf{x}_4 = \begin{pmatrix} \sqrt{2} \\ 4\sqrt{2} \end{pmatrix}, \mathbf{x}_5 = \begin{pmatrix} 1 \\ 1 \end{pmatrix} \tag{2}$$

$$\mathbf{n}^\top \begin{pmatrix} \mathbf{x}_1 & \mathbf{x}_2 & \mathbf{x}_3 & \mathbf{x}_4 & \mathbf{x}_5 \end{pmatrix} = \begin{pmatrix} c_1 & c_2 & c_3 & c_4 & c_5 \end{pmatrix} \tag{3}$$

$$\begin{pmatrix} 1 & -2 \end{pmatrix} \begin{pmatrix} 0 & 2 & 4 & \sqrt{2} & 1 \\ 2 & 0 & 0 & 4\sqrt{2} & 1 \end{pmatrix} = \begin{pmatrix} -4 & 2 & 4 & -7\sqrt{2} & -1 \end{pmatrix} \tag{4}$$

$$\tag{5}$$

Conclusion:

The point which lies on the line is only option (3).

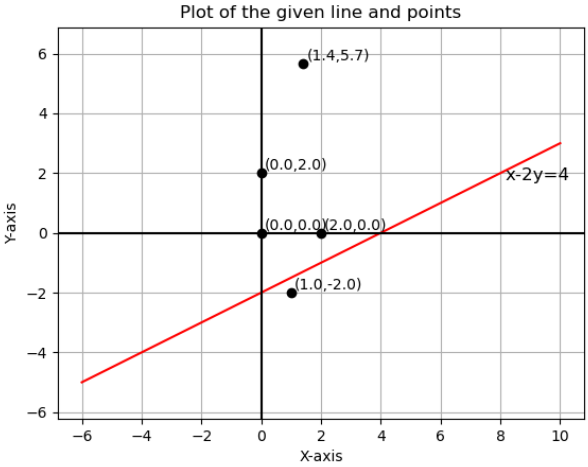

Fig. 1: Plot of the given line and points