1.6.8

EE25BTECH11058 - Tangellapalli Mohana Krishna Sushma

Question:
If three points (x, -1), (2, 1) and (4, 5) are collinear, find the value of x.
Solution:

Variable	Vectors
a	$\begin{pmatrix} x \\ -1 \end{pmatrix}$
b	$\begin{pmatrix} 2 \\ 1 \end{pmatrix}$
c	$\begin{pmatrix} 4 \\ 5 \end{pmatrix}$

TABLE 0: Variables Used

$$\Rightarrow \begin{pmatrix} a-b & a-c \end{pmatrix}$$

$$\begin{pmatrix} x-2 & x-4 \\ -1-1 & -1-5 \end{pmatrix} \Rightarrow \begin{pmatrix} x-2 & x-4 \\ -2 & -6 \end{pmatrix}$$

Changing the matrix into row echelon form, using row operations,

$$R_2 \leftrightarrow R_1 \Rightarrow \begin{pmatrix} -2 & -6 \\ x-2 & x-4 \end{pmatrix}$$

Again,

$$R_2 \rightarrow R_2 + \left(\frac{x-2}{2}\right) R_1$$

$$\begin{pmatrix} -2 & -6 \\ 0 & x-4+6-3x \end{pmatrix} = \begin{pmatrix} -2 & -6 \\ 0 & -2x+2 \end{pmatrix}$$

As the condition for three points to be collinear, Rank of the Matrix should be 1

$$-2x + 2 = 0 \Rightarrow x = 1$$

Hence, the value of x is '1'.

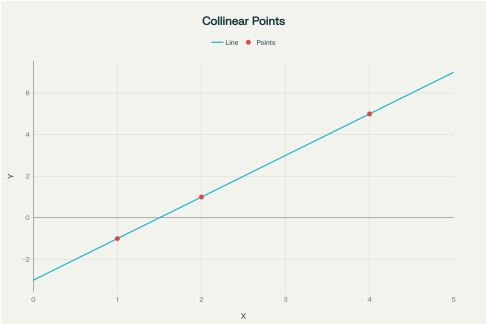

Fig. 0.1: PLOT