Question-1-1.6-8

EE24BTECH11038 - MALAKALA BALA SUBRAHMANYA ARAVIND

Question:
If the three points $\mathbf{A}\,(x,-1)$,$\mathbf{B}\,(2,1)$,$\mathbf{C}\,(4,5)$ are collinear,find the value of x
Solution:
Here $\mathbf{A} = \begin{pmatrix} x \\ -1 \end{pmatrix}$, $\mathbf{B} = \begin{pmatrix} 2 \\ 1 \end{pmatrix}$, and $\mathbf{C} = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$

point	Coordinates
A	$(x,-1)$
B	$(2,1)$
C	$(4,5)$

TABLE 0: variables used

points $\mathbf{A},\mathbf{B},\mathbf{C}$ are defined to be collinear if

$$\text{rank}\begin{pmatrix} \mathbf{B}-\mathbf{C} & \mathbf{C}-\mathbf{A} \end{pmatrix} = 1 \tag{0.1}$$

$$\begin{pmatrix} -2 & 4-x \\ -4 & 6 \end{pmatrix} \xleftrightarrow{R2 \leftarrow R1*2-R2} \tag{0.2}$$

$$\begin{pmatrix} -2 & 4-x \\ 0 & 2-2x \end{pmatrix} \tag{0.3}$$

$$\tag{0.4}$$

As rank of matrix is 1

$$2-2x = 0 \tag{0.5}$$

$$\implies x = 1 \tag{0.6}$$

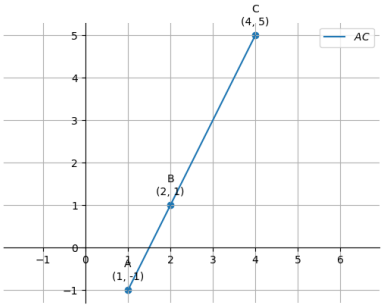

Fig. 0.1: Line **AC**