

1.6.12

EE24BTECH11033 - Kolluru Suraj

Question:

Point $(-4, 2)$ lies on the line segment joining the points $\mathbf{A} \begin{pmatrix} -4 \\ 6 \end{pmatrix}$ and $\mathbf{B} \begin{pmatrix} -4 \\ -6 \end{pmatrix}$.

Solution:

point	Coordinates
A	$\begin{pmatrix} -4 \\ 6 \end{pmatrix}$
B	$\begin{pmatrix} -4 \\ -6 \end{pmatrix}$
C	$\begin{pmatrix} -4 \\ 2 \end{pmatrix}$

TABLE 0: variables used

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

$$\text{rank}(\mathbf{B} - \mathbf{A} \quad \mathbf{C} - \mathbf{A}) = 1 \quad (0.1)$$

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} 0 \\ -12 \end{pmatrix} \quad (0.2)$$

$$\mathbf{C} - \mathbf{A} = \begin{pmatrix} 0 \\ -4 \end{pmatrix} \quad (0.3)$$

The collinearity matrix can be expressed as

$$\begin{pmatrix} 0 & 0 \\ -12 & -4 \end{pmatrix} \quad (0.4)$$

which is a rank 1 matrix. To find the ratio which \mathbf{C} divides \mathbf{A}, \mathbf{B} . Using section formula,

$$\begin{pmatrix} -4 \\ 2 \end{pmatrix} = \frac{\begin{pmatrix} -4 \\ 6 \end{pmatrix} + k \begin{pmatrix} -4 \\ -6 \end{pmatrix}}{1 + k} \quad (0.5)$$

$$\Rightarrow 2k \begin{pmatrix} 0 \\ 4 \end{pmatrix} = \begin{pmatrix} 0 \\ 4 \end{pmatrix} \quad (0.6)$$

$$\text{or, } k = \frac{1}{2}. \quad (0.7)$$

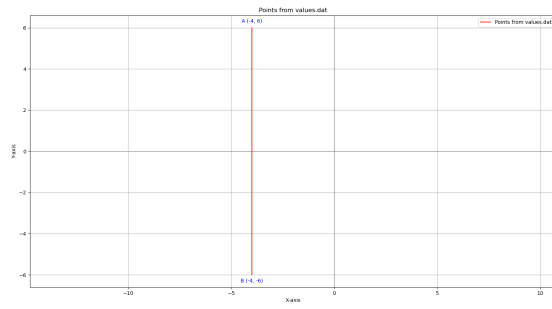


Fig. 0.1: Line connecting AB