Matrix

EE24BTECH11051 - Prajwal

1 1.5.9

Find the ratio in which the Y axis divides the line segment joining the points $\mathbf{A}\,(5,-6)$ and $\mathbf{B}\,(-1,-4)$. Also, find the coordinates of the point of intersection.

Solution:-

Section Formulae, (eq 1)

$$C = \frac{A + kB}{1 + k}$$

where k is the ratio in which C divides A and B, If C is on the Y axis then,

$$C = \begin{pmatrix} 0 \\ y \end{pmatrix}$$

Given,

$$A = \begin{pmatrix} 5 \\ -6 \end{pmatrix}, B = \begin{pmatrix} -1 \\ -4 \end{pmatrix}$$

Putting the value of A, B and C in equation 1,

$$\begin{aligned} C &= \frac{A + kB}{1 + k} \\ \begin{pmatrix} 0 \\ y \end{pmatrix} &= \frac{\begin{pmatrix} 5 \\ -6 \end{pmatrix} + k\begin{pmatrix} -1 \\ -4 \end{pmatrix}}{1 + k} \\ \implies \begin{pmatrix} 0 \\ y \end{pmatrix} &= \frac{\begin{pmatrix} 5 - k \\ -6 - 4k \end{pmatrix}}{1 + k} \\ \implies \begin{pmatrix} 0 \\ y \end{pmatrix}(1 + k) &= \begin{pmatrix} 5 - k \\ -6 - 4k \end{pmatrix} \\ \implies \begin{pmatrix} 0 \\ y(1 + k) \end{pmatrix} &= \begin{pmatrix} 5 - k \\ -6 - 4k \end{pmatrix} \end{aligned}$$

Comparing matrix in both side,

$$\begin{aligned} 5 - k &= 0 \\ \implies k &= 5 \end{aligned}$$

and,

$$y(1 + k) = -6 - 4k$$

putting the value of k,

$$\begin{aligned} y(1+k) &= -6-4k \\ \implies y(1+5) &= -6-4(5) \\ \implies y(6) &= -26 \\ \implies y &= \frac{-26}{6} \\ \implies y &= \frac{-13}{3} \end{aligned}$$

Hence, Y axis divides the line segment AB in 5 : 1 ratio And, The point on Y axis is $\mathbf{C}\left(0, \frac{-13}{3}\right)$