Question-1-1.5-2

EE24BTECH11035 - KOTHAPALLI AKHIL

Question:
Find the ratio in which the Y axis divides divides the line segment joining points $(6, -4)$ and $(-2, -7)$.Also find the point of intersection.
Solution:

Point	Coordinates
A	$\begin{pmatrix} 6 \\ -4 \end{pmatrix}$
B	$\begin{pmatrix} -2 \\ -7 \end{pmatrix}$

TABLE 0: variables used

Let the point on the Y-axis be $\begin{pmatrix} 0 \\ y \end{pmatrix}$,

The given two points are $\begin{pmatrix} 6 \\ -4 \end{pmatrix}$ and $\begin{pmatrix} -2 \\ -7 \end{pmatrix}$.

The above 3 points are collinear.

Construct a Matrix for the above points

$$M = \begin{pmatrix} 0 & y & 1 \\ 6 & -4 & 1 \\ -2 & -7 & 1 \end{pmatrix} \tag{1}$$

The Determinant of the matrix is 0

$$Det = 0(-4 + 7) - y(6 + 2) + 1(-42 - 8) = 0 \tag{2}$$

$$\implies y = -6.25 \tag{3}$$

$\therefore$ The point on Y-Axis is $\begin{pmatrix} 0 \\ -6.25 \end{pmatrix}$

Assume point **B** divides the line segment **AC** in the ratio k:1. According to the section formula:

$$\mathbf{B} = \frac{k\mathbf{C} + \mathbf{A}}{k + 1} \tag{4}$$

Substituting the values:

$$\begin{pmatrix} 0 \\ -6.25 \end{pmatrix} = \frac{k\begin{pmatrix} -2 \\ -7 \end{pmatrix} + \begin{pmatrix} 6 \\ -4 \end{pmatrix}}{k + 1} \tag{5}$$

This gives us two equations:

$$0 = \frac{-2k + 6}{k + 1} \tag{6}$$

$$-6.25 = \frac{-7k - 4}{k + 1} \tag{7}$$

Solving for k from the first equation:

$$0 = -2k + 6 \Rightarrow 2k = 6 \Rightarrow k = 3 \tag{8}$$

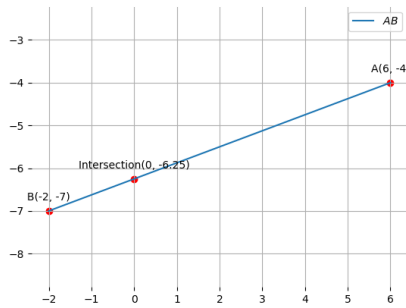Therefore, the ratio in which **B** divides **AC** is 3:1 .

Fig. 0.1: Line **AC**