

1.1.5.10

AI24BTECH11022 - Pabbuleti Venkata Charan Teja

Question:

Find the ratio in which the line segment joining the points $A(1, -5)$ and $B(-4, 5)$ is divided by the x -axis. Also, find the coordinates of the point of division.

(10,2021)

Solution:

Variable	Value
A	$(1, -5)$
B	$(-4, 5)$
$k : 1$	Ratio in which the line AB is divided by x -axis
X	Point of division of A, B

Table 1: Variables Used

If X divides AB in the ratio $k : 1$,

$$X = \frac{kB + A}{k + 1} \quad (1)$$

$$X = \frac{1}{k + 1} \begin{pmatrix} -4k + 1 \\ 5k - 5 \end{pmatrix} \quad (2)$$

$$X = \begin{pmatrix} x \\ y \end{pmatrix} \quad (3)$$

$$X = x \begin{pmatrix} 1 \\ 0 \end{pmatrix} + y \begin{pmatrix} 0 \\ 1 \end{pmatrix} \quad (4)$$

$$X = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} \quad (5)$$

$$\Rightarrow \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{k + 1} \begin{pmatrix} -4k + 1 \\ 5k - 5 \end{pmatrix} \quad (6)$$

But as X is on x -axis,

$$y = 0 \quad (7)$$

$$\frac{5k - 5}{k + 1} = 0 \quad (8)$$

$$5k - 5 = 0 \quad (9)$$

$$k = 1 \quad (10)$$

∴ The ratio in which the line is divided by x -axis is 1 : 1
 The coordinates of the point of the division is

$$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{k+1} \begin{pmatrix} -4k+1 \\ 5k-5 \end{pmatrix} \quad (11)$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \frac{1}{2} \begin{pmatrix} -3 \\ 0 \end{pmatrix} \quad (12)$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} -\frac{3}{2} \\ 0 \end{pmatrix} \quad (13)$$

∴ The point of division $(x, y) = \left(-\frac{3}{2}, 0\right)$

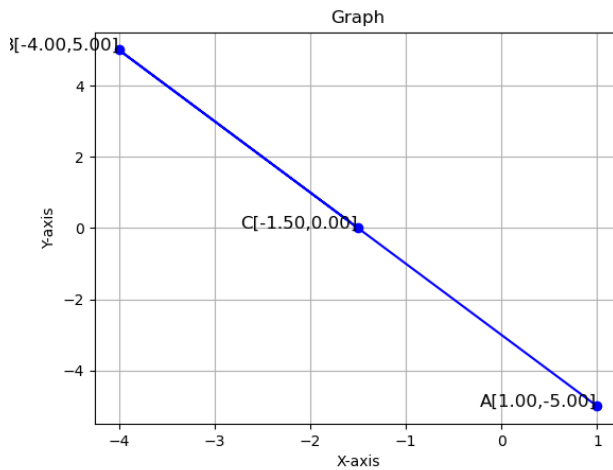


Fig. 1: Plot of the points