

# 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	Description
$A(1,-5)$	Point1
$B(-4,5)$	Point2
$k:1$	Ratio in which the line $AB$ is divided by $x$ -axis
$X(x,y)$	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,

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

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

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

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

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

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

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

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

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

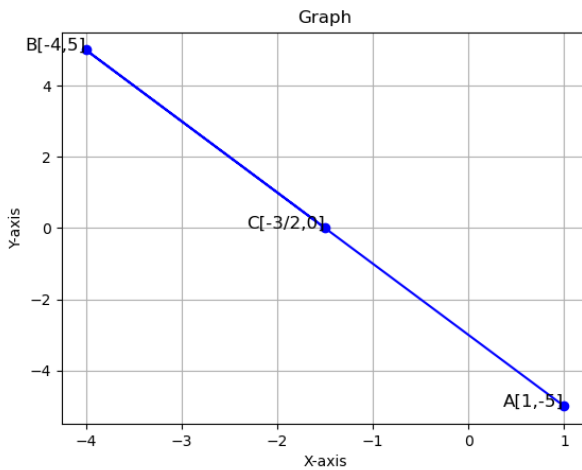


Fig. 1: Plot of the points