

# 1-1.5-32

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## Question:

Find the ratio in which the line segment joining the points  $(1, -3)$  and  $(4, 5)$  is divided by  $X$  axis.

## Solution:

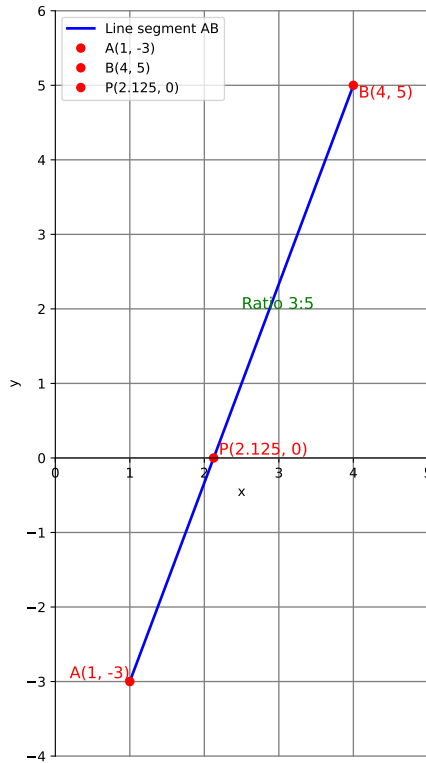


Fig. 0.1: Line Segment AB

Equation of line segment joining  $A = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$  and  $B = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$  given by

$$\frac{x-1}{3} = \frac{y+3}{8}$$

The intersection with the  $x$ -axis occurs when  $y = 0$ . Substitute  $y = 0$  into the parametric equation:

$$\frac{x-1}{3} = \frac{3}{8}$$

$$x-1 = \frac{3 \cdot 3}{8} = \frac{9}{8}$$

$$x = 1 + \frac{9}{8} = \frac{8+9}{8} = \frac{17}{8}$$

Therefore, the point of intersection with the  $x$ -axis is  $\left(\frac{17}{8}, 0\right)$ .

Let this point  $\left(\frac{17}{8}, 0\right)$  divide the segment  $AB$  in the ratio  $k : 1$ .

Using section formula,

$$\left(\frac{\frac{k \cdot 4 + 1}{k+1}}{\frac{k \cdot 5 - 3}{k+1}}\right) = \left(\frac{\frac{17}{8}}{0}\right)$$

$$\frac{\begin{pmatrix} 4 \\ 5 \end{pmatrix} k + \begin{pmatrix} 1 \\ -3 \end{pmatrix}}{k+1} = \begin{pmatrix} \frac{17}{8} \\ 0 \end{pmatrix}$$

$$\begin{pmatrix} \frac{15}{8} \\ 5 \end{pmatrix} k = \begin{pmatrix} \frac{9}{8} \\ 3 \end{pmatrix}$$

$$\text{or, } k = \frac{3}{5}$$

Hence, the ratio in which the line segment joining the points  $A = \begin{pmatrix} 1 \\ -3 \end{pmatrix}$  and  $B = \begin{pmatrix} 4 \\ 5 \end{pmatrix}$  is divided by the  $x$ -axis is  $3 : 5$ .