

ASSIGNMENT-1

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Question: Calculate the ratio in which the line joining $A = \begin{pmatrix} -4 \\ 2 \end{pmatrix}$ and $B = \begin{pmatrix} 3 \\ 6 \end{pmatrix}$ is divided by the point $P = \begin{pmatrix} z \\ 3 \end{pmatrix}$. Also find

- 1) z
- 2) Length of \overrightarrow{AP}

Solution: Lets take the ratio in which the line is divided by the point to be $1:k$. Now lets use the section formula for the point P ,

$$P = \begin{pmatrix} z \\ 3 \end{pmatrix} \quad (1)$$

$$P = \left[\frac{(1 \times B) + (k \times A)}{1 + 3} \right] \quad (2)$$

$$= \left[\frac{\left[1 \times \begin{pmatrix} 3 \\ 6 \end{pmatrix} \right] + \left[k \times \begin{pmatrix} -4 \\ 2 \end{pmatrix} \right]}{1 + 3} \right] \quad (3)$$

$$= \left[\frac{(1 \times 3) + [k \times (-4)]}{1 + 3}, \frac{(1 \times 6) + (k \times 2)}{1 + 3} \right] \quad (4)$$

$$= \begin{pmatrix} \frac{3 - 4k}{6 + 2k} \\ \frac{4}{4} \end{pmatrix} \quad (5)$$

Equating the y -coordinates from (1) and (5) get,

$$\Rightarrow 3 = \frac{6 + 2k}{4} \quad (6)$$

$$\Rightarrow 6 = 2k \quad (7)$$

$$\Rightarrow k = 3 \quad (8)$$

\therefore the ratio in which the line \overrightarrow{AB} is divided by P is 1:3.

1) Taking equation (5) and substituting (8) we get,

$$P = \begin{pmatrix} \frac{3 - 4k}{6 + 2k} \\ \frac{4}{4} \end{pmatrix} \quad (9)$$

$$= \begin{pmatrix} \frac{3 - (4 \times 3)}{6 + (2 \times 3)} \\ \frac{4}{4} \end{pmatrix} \quad (10)$$

$$= \begin{pmatrix} \frac{-9}{12} \\ \frac{4}{4} \end{pmatrix} \quad (11)$$

$$\therefore \text{ the point } P = \begin{pmatrix} -2.25 \\ 3 \end{pmatrix} \quad (12)$$

2) Now the vector

$$\overrightarrow{AP} = P - A \quad (13)$$

$$= \begin{pmatrix} -2.25 \\ 3 \end{pmatrix} - \begin{pmatrix} -4 \\ 2 \end{pmatrix} \quad (14)$$

$$= \begin{pmatrix} 1.75 \\ 1 \end{pmatrix} \quad (15)$$

$$\text{Length of } \overrightarrow{AP} = \|\overrightarrow{AP}\|_2 \quad (16)$$

$$= \sqrt{(x)^2 + (y)^2} \quad (17)$$

$$= \sqrt{(1.75)^2 + (1)^2} \quad (18)$$

$$= 2.015 \quad (19)$$

The length of the line $\overrightarrow{AP} = 2.015$ (Approx).

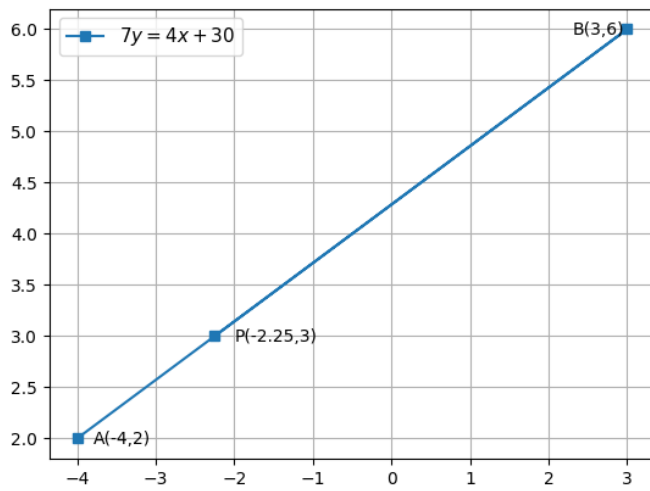


Fig. 1. Graph showing the line $7y = 4x + 30$.