

1.5.31

EE25BTECH11044 - Sai Hasini Pappula

Question:

Find the coordinates of a point \mathbf{P} , which lies on the line segment joining the points \mathbf{A} $(-2,2)$ and \mathbf{B} $(2,-4)$ such that $AP = \frac{3}{7}AB$

Solution:

We are given two points

$$\mathbf{A} = \begin{bmatrix} -2 \\ 2 \end{bmatrix}, \quad \mathbf{B} = \begin{bmatrix} 2 \\ -4 \end{bmatrix},$$

and a point \mathbf{P} on the line segment AB such that

$$AP = \frac{3}{7}AB.$$

Step 1: Formula

The section formula in vector form is

$$\mathbf{P} = \mathbf{A} + \frac{AP}{AB}(\mathbf{B} - \mathbf{A}).$$

Step 2: Substitution

Since $\frac{AP}{AB} = \frac{3}{7}$,

$$\mathbf{P} = \mathbf{A} + \frac{3}{7}(\mathbf{B} - \mathbf{A}).$$

$$\mathbf{B} - \mathbf{A} = \begin{bmatrix} 2 \\ -4 \end{bmatrix} - \begin{bmatrix} -2 \\ 2 \end{bmatrix} = \begin{bmatrix} 4 \\ -6 \end{bmatrix}.$$

$$\frac{3}{7}(\mathbf{B} - \mathbf{A}) = \frac{3}{7} \begin{bmatrix} 4 \\ -6 \end{bmatrix} = \begin{bmatrix} \frac{12}{7} \\ -\frac{18}{7} \end{bmatrix}.$$

$$\mathbf{P} = \begin{bmatrix} -2 \\ 2 \end{bmatrix} + \begin{bmatrix} \frac{12}{7} \\ -\frac{18}{7} \end{bmatrix} = \begin{bmatrix} -\frac{2}{7} \\ -\frac{4}{7} \end{bmatrix}.$$

Final Answer

$$\mathbf{P} = \begin{bmatrix} -\frac{2}{7} \\ -\frac{4}{7} \end{bmatrix} \Rightarrow P\left(-\frac{2}{7}, -\frac{4}{7}\right).$$

Points A, B and P with P on segment AB ($AP = \frac{3}{7} AB$)

