

# 1.4.26

EE25BTECH11010 - Arsh Dhoke

## Question:

The position vector of the point which divides the join of points  $2\mathbf{a} - 3\mathbf{b}$  and  $\mathbf{a} + \mathbf{b}$  in the ratio  $3 : 1$  is \_\_\_\_\_.

## Solution:

$$\mathbf{P} = 2\mathbf{a} - 3\mathbf{b} \quad (0.1)$$

$$\mathbf{Q} = \mathbf{a} + \mathbf{b} \quad (0.2)$$

Now, the matrix form for  $\mathbf{Q}$  and  $\mathbf{P}$  is:

$$\begin{pmatrix} \mathbf{Q} & \mathbf{P} \end{pmatrix} = \begin{pmatrix} \mathbf{a} & \mathbf{b} \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 1 & -3 \end{pmatrix} \quad (0.3)$$

Using the section formula, the point  $\mathbf{R}$  dividing  $\mathbf{Q} - \mathbf{P}$  in ratio  $3 : 1$  is:

$$\mathbf{R} = \frac{3\mathbf{Q} + 1\mathbf{P}}{3 + 1} \quad (0.4)$$

$$\mathbf{R} = \frac{1}{4} \cdot \begin{pmatrix} \mathbf{Q} & \mathbf{P} \end{pmatrix} \begin{pmatrix} 3 \\ 1 \end{pmatrix} \quad (0.5)$$

$$\mathbf{R} = \frac{1}{4} \cdot \begin{pmatrix} \mathbf{a} & \mathbf{b} \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 1 & -3 \end{pmatrix} \begin{pmatrix} 3 \\ 1 \end{pmatrix} \quad (0.6)$$

$$\mathbf{R} = \frac{1}{4} \cdot \begin{pmatrix} \mathbf{a} & \mathbf{b} \end{pmatrix} \begin{pmatrix} 5 \\ 0 \end{pmatrix} \quad (0.7)$$

$$\mathbf{R} = \frac{1}{4} \cdot (5\mathbf{a}) \quad (0.8)$$

Let  $\mathbf{a} = 1$  and  $\mathbf{b} = 1$ .

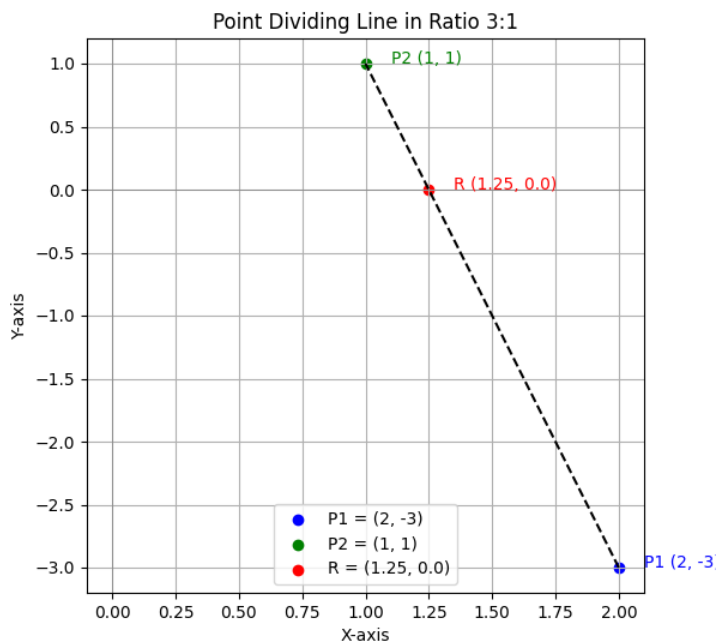


Fig. 0.1: Graph for question 1