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:

$$\mathbf{P} = 2\mathbf{a} - 3\mathbf{b} = \begin{pmatrix} 2a \\ -3b \end{pmatrix}, \tag{0.1}$$

$$\mathbf{Q} = \mathbf{a} + \mathbf{b} = \begin{pmatrix} a \\ b \end{pmatrix}. \tag{0.2}$$

Using section formula, the point R dividing PQ in ratio 3 : 1 is

$$\mathbf{R} = \frac{3\mathbf{Q} + 1\mathbf{P}}{3+1}. \tag{0.3}$$

$$\mathbf{R} = \begin{pmatrix} Q & P \end{pmatrix} \begin{pmatrix} \frac{3}{4} \\ \frac{1}{4} \end{pmatrix} \tag{0.4}$$

$$\mathbf{R} = \left(\begin{pmatrix} a \\ b \end{pmatrix} \quad \begin{pmatrix} 2a \\ -3b \end{pmatrix} \right) \begin{pmatrix} \frac{3}{4} \\ \frac{1}{4} \end{pmatrix} \tag{0.5}$$

$$\mathbf{R} = \frac{1}{4}\left(3\begin{pmatrix} a \\ b \end{pmatrix} + \begin{pmatrix} 2a \\ -3b \end{pmatrix}\right) \tag{0.6}$$

$$= \frac{1}{4}\begin{pmatrix} 3a + 2a \\ 3b - 3b \end{pmatrix} \tag{0.7}$$

$$= \frac{1}{4}\begin{pmatrix} 5a \\ 0 \end{pmatrix} \tag{0.8}$$

$$= \begin{pmatrix} \frac{5a}{4} \\ 0 \end{pmatrix}. \tag{0.9}$$

$$\boxed{\mathbf{R} = \begin{pmatrix} \frac{5a}{4} \\ 0 \end{pmatrix}} \tag{0.10}$$

Let a=1 and b=0.

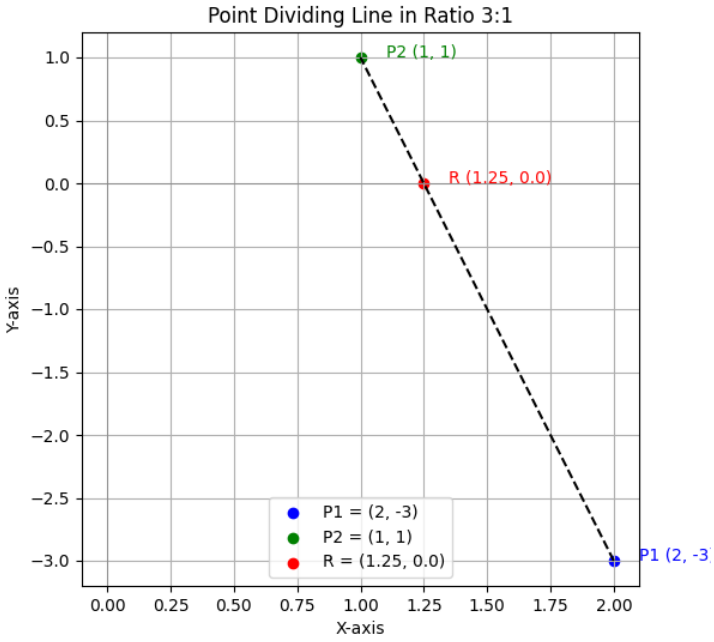

Fig. 0.1. Graph for question 1