1-1.4-9n

EE24BTECH11022 - Eshan Sharma

Question:

Consider two points **P** and **Q** with position vectors $\overrightarrow{OP} = 3\vec{a} - 2\vec{b}$ and $\overrightarrow{OQ} = \vec{a} + \vec{b}$. Find the position vector of a point **R** which divides the line joining **P** and **Q** in the ratio 2 : 1,

i) internally, and

ii) externally

Solution:

Using Section formula,

i) For internal,

$$\overrightarrow{OP} = 3\vec{a} - 2\vec{b}$$

$$\overrightarrow{OQ} = \vec{a} + \vec{b}$$

$$\overrightarrow{OR} = \frac{1 \times \overrightarrow{OP} + 2 \times \overrightarrow{OQ}}{3}$$

$$\overrightarrow{OR} = \frac{1 \times (3\vec{a} - 2\vec{b}) + 2 \times (\vec{a} + \vec{b})}{3}$$

$$\overrightarrow{OR} = \frac{3\vec{a} - 2\vec{b} + 2\vec{a} + 2\vec{b}}{3}$$

$$\overrightarrow{OR} = \frac{5\vec{a}}{3}$$

ii) For external,

$$\overrightarrow{OP} = 3\vec{a} - 2\vec{b}$$

$$\overrightarrow{OQ} = \vec{a} + \vec{b}$$

$$\overrightarrow{OR} = \frac{2 \times \overrightarrow{OQ} - 1 \times \overrightarrow{OP}}{2 - 1}$$

$$\overrightarrow{OR} = \frac{2 \times (\vec{a} + \vec{b}) - 1 \times (3\vec{a} - 2\vec{b})}{1}$$

$$\overrightarrow{OR} = \frac{2\vec{a} + 2\vec{b} - 3\vec{a} + 2\vec{b}}{1}$$
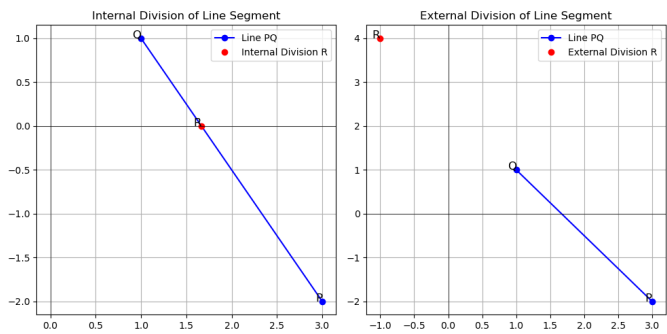
$$\overrightarrow{OR} = -\vec{a} + 4\vec{b}$$

Fig. 0.1: Plot of $\overrightarrow{OR}$ in internal and external division