

Assignment 1

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1 Assignment 1

Question 21 : Find the coordinates of the points which divide, internally and externally, the line joining the point $(a+b, a-b)$ to the point $(a-b, a+b)$ in the ratio $a: b$.

Solution :

Let us consider P be the point which divides the AB line segment in the ratio $a: b$ internally and externally. Suppose \vec{a} and \vec{b} are the position vectors of the points \mathbf{A} and \mathbf{B} respectively referred to the origin \mathbf{O} and \vec{c} be the position vector of point \mathbf{P} which we have to find out.

Given that the coordinates of A point = $(a+b, a-b)$ and coordinates of B point = $(a-b, a+b)$.

So we can write \mathbf{A} and \mathbf{B} as product of a matrix and a vector,

$$\mathbf{A} = \vec{a} = \begin{bmatrix} (a+b) & (a-b) \end{bmatrix} \begin{pmatrix} \hat{i} \\ \hat{j} \end{pmatrix}^T \quad (1)$$

$$\vec{a} = (a+b)\hat{i} + (a-b)\hat{j} \quad (2)$$

$$\mathbf{B} = \vec{b} = \begin{bmatrix} (a-b) & (a+b) \end{bmatrix} \begin{pmatrix} \hat{i} \\ \hat{j} \end{pmatrix}^T \quad (3)$$

$$\vec{b} = (a-b)\hat{i} + (a+b)\hat{j} \quad (4)$$

and

$$\frac{AP}{PB} = \frac{a}{b} \quad (5)$$

According to the Internal Division Section Formula, coordinates of \mathbf{P} :

$$\mathbf{P} = \left(\frac{a(a-b) + b(a+b)}{a+b}, \frac{a(a+b) + b(a-b)}{a+b} \right) \quad (6)$$

According to the External Division Section Formula, coordinates of \mathbf{P} :

$$\mathbf{P} = \left(\frac{a(a-b) - b(a+b)}{a-b}, \frac{a(a+b) - b(a-b)}{a-b} \right) \quad (7)$$

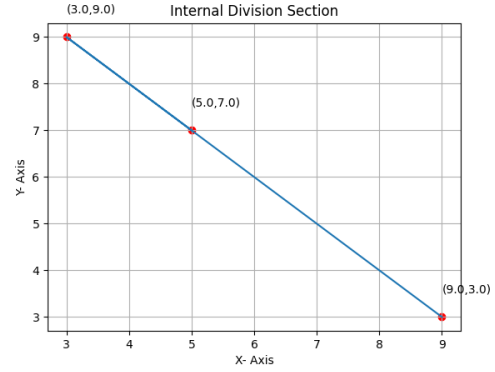


Figure 1: Internal Division Section

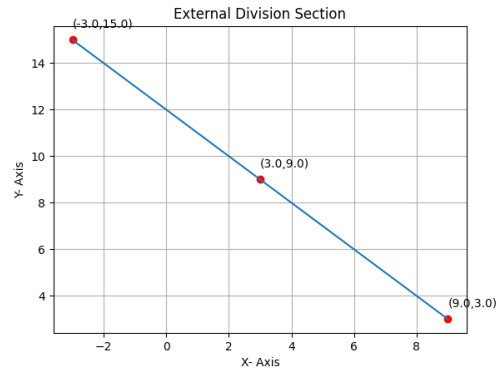


Figure 2: External Division Section