Assignment 1

Diptasri Ghosh

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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 **A** and **B** respectively referred to the origin **O** and $\vec{c}$ be the position vector of point **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 **A** and **B** as product of a matrix and a vector,

$$\mathbf{A} = \vec{a} = \left[\begin{pmatrix} a+b & a-b \end{pmatrix} \begin{pmatrix} \hat{i} \\ \hat{j} \end{pmatrix}\right]^\top \tag{1}$$

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

$$\mathbf{B} = \vec{b} = \left[\begin{pmatrix} a-b & a+b \end{pmatrix} \begin{pmatrix} \hat{i} \\ \hat{j} \end{pmatrix}\right]^\top \tag{3}$$

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

and

$$\frac{AP}{PB} = \frac{a}{b} \tag{5}$$

According the Internal Division Section Formula, coordinates of **P**:

$$\mathbf{P}(x_1, y_1) = \left(\frac{a(a-b)+b(a+b)}{a+b}, \frac{a(a+b)+b(a-b)}{a+b}\right) \tag{6}$$

According the External Division Section Formula, coordinates of **P**:

$$\mathbf{P}(x_2, y_2) = \left(\frac{a(a-b)-b(a+b)}{a-b}, \frac{a(a+b)-b(a-b)}{a-b}\right) \tag{7}$$

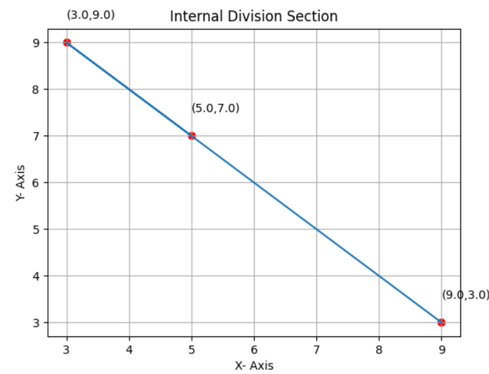

Figure 1: Internal Division Section

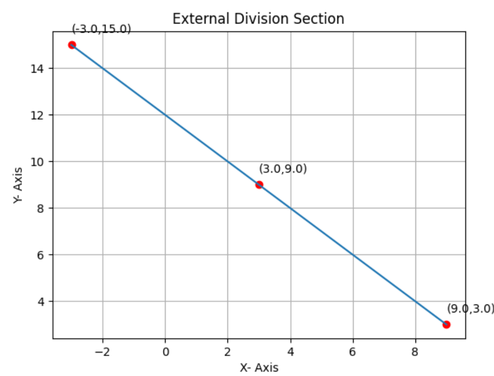

Figure 2: External Division Section