Assignment 5

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Find Python Codes from below link

https://github.com/KeshavRoy/Assignment_5

and latex-tikz codes from

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1 Examples 1

1.1 Question 21

Find coordinates of the point which divides, internally and externally, the line joining $(a+b, a-b)$ to $(a-b, a+b)$ in the ratio $a : b$

$$\mathbf{A} = \begin{pmatrix} a+b \\ a-b \end{pmatrix} \qquad \mathbf{B} = \begin{pmatrix} a-b \\ a+b \end{pmatrix} \tag{1.1.1}$$

1.2 Solution

The coordinates of point P, internally dividing the line AB in the ratio $m : n$ is given by

$$\mathbf{P} = \frac{m\mathbf{B} + n\mathbf{A}}{m+n} \tag{1.2.1}$$

Let $\mathbf{A} = \begin{pmatrix} a+b \\ a-b \end{pmatrix}, \mathbf{B} = \begin{pmatrix} a-b \\ a+b \end{pmatrix}, m = a, n = b$

From (1.2.1)

$$\mathbf{P} = \frac{a\begin{pmatrix} a-b \\ a+b \end{pmatrix} + b\begin{pmatrix} a+b \\ a-b \end{pmatrix}}{a+b} \tag{1.2.2}$$

$$\mathbf{P} = \frac{\begin{pmatrix} a^2-ab \\ a^2+ab \end{pmatrix} + \begin{pmatrix} ab+b^2 \\ ab-b^2 \end{pmatrix}}{a+b} \tag{1.2.3}$$

$$\mathbf{P} = \frac{\begin{pmatrix} a^2+b^2 \\ a^2-b^2 \end{pmatrix}}{a+b} \tag{1.2.4}$$

$$\mathbf{P} = \frac{\left(a^2+b^2\right)}{a+b}, \frac{\left(a^2+2ab-b^2\right)}{a+b} \tag{1.2.5}$$

The coordinates of point Q, externally dividing the line AB in the ratio $m : n$ is given by

$$\mathbf{Q} = \frac{m\mathbf{B} - n\mathbf{A}}{m-n} \tag{1.2.6}$$

From (1.2.6)

$$\mathbf{Q} = \frac{a\begin{pmatrix} a-b \\ a+b \end{pmatrix} - b\begin{pmatrix} a+b \\ a-b \end{pmatrix}}{a+b} \tag{1.2.7}$$

$$\mathbf{Q} = \frac{\begin{pmatrix} a^2-ab \\ a^2+ab \end{pmatrix} - \begin{pmatrix} ab+b^2 \\ ab-b^2 \end{pmatrix}}{a+b} \tag{1.2.8}$$

$$\mathbf{Q} = \frac{\begin{pmatrix} a^2-b^2 \\ a^2+b^2 \end{pmatrix}}{a+b} \tag{1.2.9}$$

$$\mathbf{Q} = \frac{\left(a^2-2ab-b^2\right)}{a-b}, \frac{\left(a^2+b^2\right)}{a-b} \tag{1.2.10}$$