ASSIGNMENT-1

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Download all python codes from

https://github.com/kavya/ASSIGNMENT−1/tree/main/ASSIGNMENT%201/CODES

and latex-tikz codes from

https://github.com/kavya/ASSIGNMENT−1/tree/main/ASSIGNMENT%201

1 QUESTION NO-2.10

Construct $\triangle ABC$ where AB=4.5,BC=5 and CA=6

2 SOLUTION

Let the vertices of $\triangle ABC$ be

$$\mathbf{A} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} a \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} p \\ q \end{pmatrix} \tag{2.0.1}$$

Then

$$\|\mathbf{B}-\mathbf{A}\|^2 = \|\mathbf{B}\|^2 = c^2 = (4.5)^2 = 20.25 \tag{2.0.2}$$

$$\|\mathbf{C}-\mathbf{A}\|^2 = \|\mathbf{C}\|^2 = b^2 = 6^2 = 36 \tag{2.0.3}$$

$$\|\mathbf{B}-\mathbf{C}\|^2 = a^2 = 5^2 = 25 \tag{2.0.4}$$

From(2.0.4)

$$\begin{aligned} a^2 &= \|\mathbf{B}-\mathbf{C}\|^2 = \|\mathbf{B}-\mathbf{C}\|^T \|\mathbf{B}-\mathbf{C}\| \\ &= \mathbf{B}^T\mathbf{B} + \mathbf{C}^T\mathbf{C} - \mathbf{B}^T\mathbf{C} - \mathbf{C}^T\mathbf{B} \\ &= \|\mathbf{B}\|^2 + \|\mathbf{C}\|^2 - 2\mathbf{B}^T\mathbf{C} \\ a^2 &= b^2 + c^2 - 2bp \\ p &= (b^2 + c^2 - a^2)/2b \\ p &= (6^2 + (4.5)^2 - 5^2)/2(6) \\ p &= 2.6041 \end{aligned}$$

From(2.0.2)

$$\|\mathbf{B}\|^2 = c^2 = p^2 + q^2 \tag{2.0.5}$$

$$(4.5)^2 = 2.6041 + q^2 \tag{2.0.6}$$

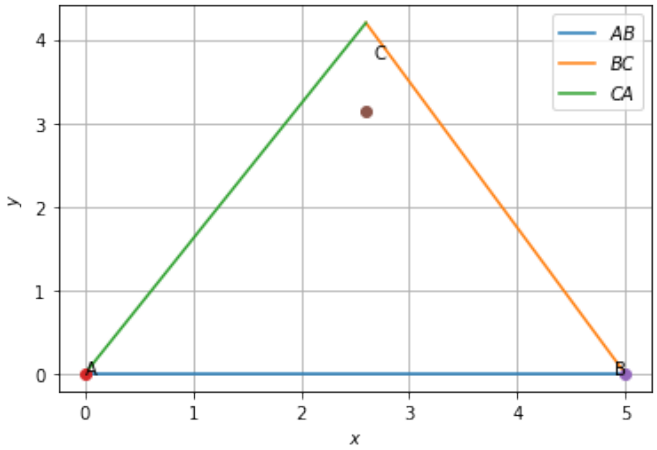
$$q^2 = 17.6458333 \tag{2.0.7}$$

$$q = 4.2006 \tag{2.0.8}$$

Now, Vertices of given $\triangle ABC$ can be written as,

$$\mathbf{C} = \begin{pmatrix} p \\ q \end{pmatrix} = \begin{pmatrix} 2.6041 \\ 4.2006 \end{pmatrix}, \mathbf{A} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} a \\ 0 \end{pmatrix} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} \tag{2.0.9}$$

Now, $\triangle ABC$ can be plotted using vertices AB ,BC and CA .
Plot of the $\triangle ABC$:



$\triangle ABC$