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

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

Then

$$\|\mathbf{A}-\mathbf{B}\|^2 = \|\mathbf{A}\|^2 = c^2 = (4.5)^2 = 20.25 \tag{2.0.2}$$
$$\|\mathbf{C}-\mathbf{B}\|^2 = \|\mathbf{C}\|^2 = a^2 = 5^2 = 25 \tag{2.0.3}$$
$$\|\mathbf{A}-\mathbf{C}\|^2 = b^2 = 6^2 = 36 \tag{2.0.4}$$

From(2.0.4)

$$\begin{aligned} b^2 = \|\mathbf{A}-\mathbf{C}\|^2 &= \|\mathbf{A}-\mathbf{C}\|^T \|\mathbf{A}-\mathbf{C}\| \\ &= \mathbf{A}^T\mathbf{A} + \mathbf{C}^T\mathbf{C} - \mathbf{A}^T\mathbf{C} - \mathbf{C}^T\mathbf{A} \\ &= \|\mathbf{A}\|^2 + \|\mathbf{C}\|^2 - 2\mathbf{A}^T\mathbf{C} \end{aligned}$$

$b^2 = a^2 + c^2 - 2ab$
$p = (a^2 + c^2 - b^2)/2a$
$p = (5^2 + (4.5)^2 - 6^2)/2(5)$
$p = 0$

From(2.0.2)

$$\|\mathbf{A}\|^2 = c^2 = p^2 + q^2 \tag{2.0.5}$$
$$(4.5)^2 = 0 + q^2 \tag{2.0.6}$$
$$q^2 = 20.25 \tag{2.0.7}$$
$$q = 4.5 \tag{2.0.8}$$

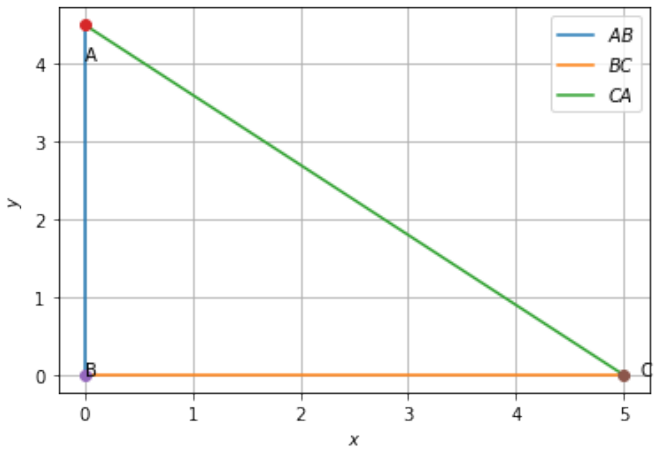
We now ,use the law of cosin

$$b^2 = a^2 + c^2 - 2accosB \tag{2.0.9}$$
$$36 = 25 + 20.25 - 202.5cosB \tag{2.0.10}$$
$$202.5cosB = 25 + 20.25 - 36 \tag{2.0.11}$$
$$202.5cosB = 9.25 \tag{2.0.12}$$
$$cosB = 9.25/202.5 \tag{2.0.13}$$
$$cosB = 0 \tag{2.0.14}$$
$$\angle B = arccos(0) \tag{2.0.15}$$
$$\angle B = 90 \tag{2.0.16}$$

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

$$\mathbf{A} = \begin{pmatrix} p \\ q \end{pmatrix} = \begin{pmatrix} 0 \\ 4.5 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} a \\ 0 \end{pmatrix} = \begin{pmatrix} 5 \\ 0 \end{pmatrix} \tag{2.0.17}$$

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



Right Angle $\triangle ABC$