Assignment 1

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Download all python codes from

https://github.com/Y.kavya/Matrix−Theory/tree/main/Assignment1/Codes

and latex-tikz codes from

https://github.com/Y.kavya/Matrix−Theory/tree/main/Assignment1

1 Question No. 2.10

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

2 Explanation

Let us assume that:

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

Then

$$AB = \|\mathbf{B} - \mathbf{A}\|^2 = \|\mathbf{B}\|^2 = c^2 \quad \because \mathbf{A} = \mathbf{0} \tag{2.0.2}$$

$$BC = \|\mathbf{B} - \mathbf{C}\|^2 = a^2 \tag{2.0.3}$$

$$AC = \|\mathbf{C} - \mathbf{A}\|^2 = \|\mathbf{C}\|^2 = b^2 \tag{2.0.4}$$

The vertex C can be expressed in polar coordinate form as

$$\mathbf{C} = b \begin{pmatrix} \cos A \\ \sin A \end{pmatrix} \tag{2.0.5}$$

From $\triangle ABC$,we use the law of cosines:

$$a^2 = b^2 + c^2 - 2bc \cos A \tag{2.0.6}$$

$$\cos A = \frac{b^2 + c^2 - a^2}{2bc} \tag{2.0.7}$$

$$\cos A = \frac{31.25}{54} \tag{2.0.8}$$

$$\cos A = 0.5787 \tag{2.0.9}$$

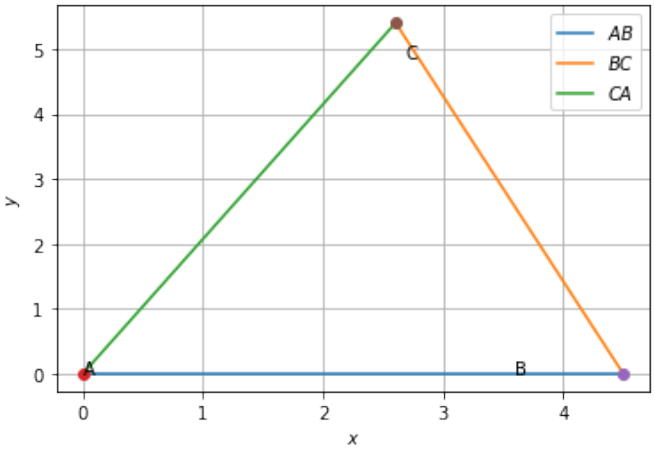
$$\mathbf{A} = 54.640 \tag{2.0.10}$$

$$\text{Then, } \mathbf{C} = 6 \begin{pmatrix} \cos 54.640 \\ \sin 54.640 \end{pmatrix} \tag{2.0.11}$$

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

$$\mathbf{C} = \begin{pmatrix} 3.472 \\ 3.990 \end{pmatrix}, \mathbf{A} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} c \\ 0 \end{pmatrix} = \begin{pmatrix} 4.5 \\ 0 \end{pmatrix} \tag{2.0.12}$$

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



$\triangle ABC$