Assignment 1

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1 QUESTION No. 2.10

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

2 EXPLANATION

Let us assume that:

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

Then

$$AB = \|\mathbf{B} - \mathbf{A}\|^2 = \|\mathbf{B}\|^2 = c^2 \quad \because \mathbf{A} = \mathbf{0} \quad (2.0.2)$$
$$BC = \|\mathbf{B} - \mathbf{C}\|^2 = a^2 \quad (2.0.3)$$
$$AC = \|\mathbf{C} - \mathbf{A}\|^2 = \|\mathbf{C}\|^2 = b^2 \quad (2.0.4)$$

The vertex C can be expressed in polar coordinate form as

$$\mathbf{C} = b \begin{pmatrix} \cos A \\ \sin A \end{pmatrix} \quad (2.0.5)$$

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

$$a^2 = b^2 + c^2 - 2bc \cos A \quad (2.0.6)$$
$$cosA = \frac{b^2 + c^2 - a^2}{2bc} \quad (2.0.7)$$
$$cosA = \frac{31.25}{54} \quad (2.0.8)$$
$$cosA = 0.578703704 \quad (2.0.9)$$
$$\angle A = arccos(0.578703704) \quad (2.0.10)$$
$$\angle A = 54.6405804 \quad (2.0.11)$$

$$\text{Then, } \mathbf{C} = 6 \begin{pmatrix} \cos 54.6405804 \\ \sin 54.6405804 \end{pmatrix} \quad (2.0.12)$$

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

$$\mathbf{C} = \begin{pmatrix} 3.47222222 \\ 3.99061214 \end{pmatrix}, \mathbf{A} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} c \\ 0 \end{pmatrix} = \begin{pmatrix} 4.5 \\ 0 \end{pmatrix} \quad (2.0.13)$$

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

$\triangle ABC$