Assignment 1

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1 QUESTION No.2.16

Construct an isosceles triangle in which the lengths of the equal sides is 6.5 and the angle between them is 110°.

2 SOLUTION

The vertices are:

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

In $\triangle ABC$,

$$\angle A + \angle B + \angle C = 180^\circ \quad (\because \angle B = \angle C) \quad (2.0.2)$$
$$\angle B = \angle C = 35^\circ \quad (2.0.3)$$

$$\mathbf{BC} = 2a\cos(35) \quad (\because a = 6.5) \quad (2.0.4)$$
$$= 10.6 \quad (2.0.5)$$

The vertex B can be expressed in polar coordinate form as

$$\mathbf{B} = b \begin{pmatrix} \cos A \\ \sin A \end{pmatrix} \quad (2.0.6)$$

B can be expressed as

$$= 6.5 \begin{pmatrix} \cos 110 \\ \sin 110 \end{pmatrix} \quad (\because b = 6.5) \quad (2.0.7)$$

$$= 6.5 \begin{pmatrix} -0.34202 \\ 0.93969 \end{pmatrix} \quad (2.0.8)$$

$$= \begin{pmatrix} -2.22313 \\ 6.10798 \end{pmatrix} \quad (2.0.9)$$

So, the vertices of $\triangle ABC$ are

$$\mathbf{A} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 6.5 \\ 0 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} -2.22313 \\ 6.10798 \end{pmatrix} \quad (2.0.10)$$
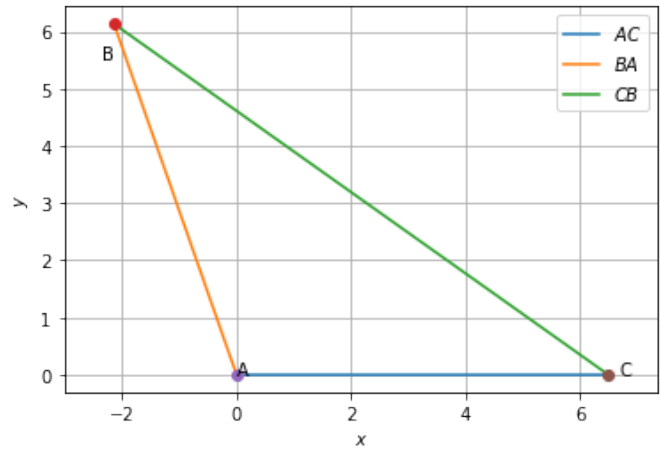
Plot of the Isosceles $\triangle ABC$:

Fig. 2.1: Isosceles triangle $\triangle ABC$