3.2.13

EE24BTECH11002 - Agamjot Singh

Question:
Draw a triangle **ABC** in which **AB** = 5cm, **BC** = 6cm and $\angle$**ABC** = 60°.
Solution:

Variable	Description
A	Point to be found
B	$(0,0)$ point
C	$(6,0)$ point
$\angle$**ABC**	60°

TABLE 0: Variables Used

The rotation matrix (**P**) is given by,

$$\mathbf{P} = \begin{pmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{pmatrix} \tag{1}$$

where θ is the angle rotated in anti-clockwise direction.
The coordinates of $\triangle ABC$ can then be expressed as

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 6 \\ 0 \end{pmatrix} \tag{2}$$

$$\mathbf{A} = \|\mathbf{B} - \mathbf{A}\| \begin{pmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{pmatrix} \frac{(\mathbf{C} - \mathbf{B})}{\|\mathbf{C} - \mathbf{B}\|} \tag{3}$$

$$\implies \mathbf{A} = 5 \begin{pmatrix} \frac{1}{2} & \frac{-\sqrt{3}}{2} \\ \frac{\sqrt{3}}{2} & \frac{1}{2} \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \tag{4}$$

$$\implies \mathbf{A} = \begin{pmatrix} \frac{5}{2} \\ \frac{5\sqrt{3}}{2} \end{pmatrix} \tag{5}$$

The choice of **B** and **C** will not change the properties of the triangle, because the angles and side lengths of the triangle do not change by fixing **B** and **C**, as **A** will be relative to **C** − **B**.

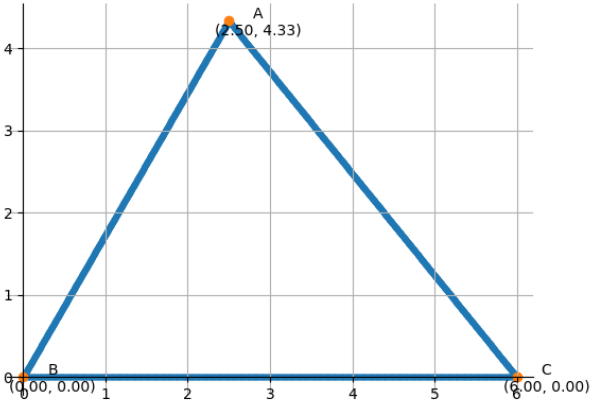

Fig. 0: Graph representing $\triangle$**ABC**