

3.2.13

EE24BTECH11002 - Agamjot Singh

Question:

Draw a triangle $\triangle ABC$ in which $AB = 5\text{cm}$, $BC = 6\text{cm}$ and $\angle ABC = 60^\circ$.

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 (\mathbf{P}) is given by,

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

where θ is the angle rotated in anti-clockwise direction.

The coordinates of $\triangle ABC$ can then be expressed as

$$\mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 6 \\ 0 \end{pmatrix}, \mathbf{A} = \|\mathbf{AB}\| \mathbf{P} \left(\frac{\mathbf{BC}}{\|\mathbf{BC}\|} \right) \quad (2)$$

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

$$\Rightarrow \mathbf{A} = 5 \begin{pmatrix} \frac{1}{2} & \frac{-\sqrt{3}}{2} \\ \frac{\sqrt{3}}{2} & \frac{1}{2} \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} \quad (4)$$

$$\Rightarrow \mathbf{A} = \begin{pmatrix} \frac{5}{2} \\ \frac{5\sqrt{3}}{2} \end{pmatrix} \quad (5)$$

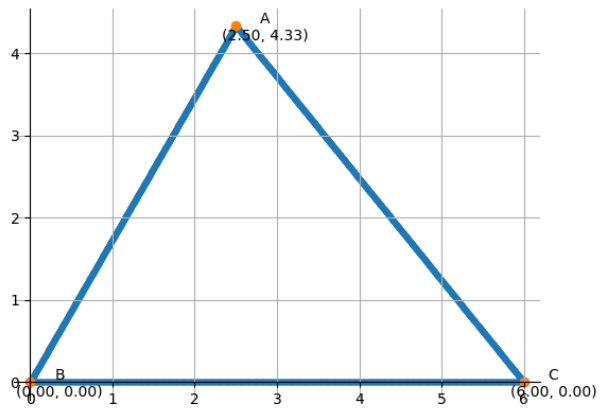


Fig. 0: Graph representing $\triangle ABC$