

# 1.11.7

EE24BTECH11001 - Aditya Tripathy

## Question:

Construct an equilateral triangle ABC with each side 5cm.

## Solution:

Let  $\mathbf{A} = \mathbf{0}$ , and  $\mathbf{B} = \begin{pmatrix} 5 \\ 0 \end{pmatrix}$ .  $\mathbf{C}$  is the required vertex.

Since the triangle is equilateral,

$$\mathbf{C} = R(\mathbf{B} - \mathbf{A}) \quad (1)$$

$$R = \begin{pmatrix} \cos \frac{\pi}{3} & -\sin \frac{\pi}{3} \\ \sin \frac{\pi}{3} & \cos \frac{\pi}{3} \end{pmatrix} \quad (2)$$

where  $R$  is the rotation matrix which rotates the vector  $\mathbf{B} - \mathbf{A}$  by angle  $\frac{\pi}{3}$ . On calculation,

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

$$\mathbf{C} = \begin{pmatrix} \frac{5}{2} \\ \frac{5\sqrt{3}}{2} \end{pmatrix} \quad (4)$$

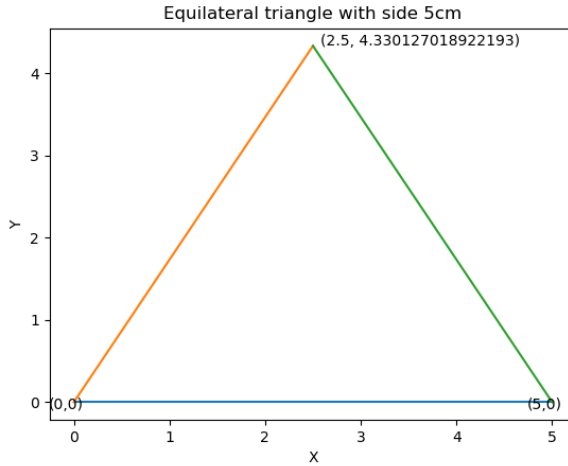


Fig. 0: equilateral triangle of side 5cm