

# Assignment 1

Y.Nagarani

Download all python codes from

<https://github.com/Y.Nagarani/Matrix-Theory/tree/main/Assignment1/Codes>

and latex-tikz codes from

<https://github.com/Y.Nagarani/Matrix-Theory/tree/main/Assignment1>

## 1 QUESTION No. 2.1

Construct  $\triangle ABC$  of sides  $a = 4$ ,  $b = 5$  and  $c=6$

## 2 EXPLANATION

Let us assume that:

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

Then

$$AB = \|\mathbf{A} - \mathbf{B}\|^2 = \|\mathbf{A}\|^2 = c^2 \quad \because \mathbf{B} = \mathbf{0} \quad (2.0.2)$$

$$BC = \|\mathbf{C} - \mathbf{B}\|^2 = \|\mathbf{C}\|^2 = a^2 \quad (2.0.3)$$

$$AC = \|\mathbf{A} - \mathbf{C}\|^2 = b^2 \quad (2.0.4)$$

From (2.0.4), The vertex  $\mathbf{A}$  can be expressed in *polar coordinate form* as

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

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

$$b^2 = a^2 + c^2 - 2ac \cos B \quad (2.0.6)$$

$$\cos B = \frac{a^2 + c^2 - b^2}{2ac} \quad (2.0.7)$$

$$\cos B = \frac{27}{48} \quad (2.0.8)$$

$$\cos B = 0.5625 \quad (2.0.9)$$

$$(2.0.10)$$

we know that

$$\sin B = \sqrt{1 - \cos^2 B} \quad (2.0.11)$$

$$\sin B = 0.8267972 \quad (2.0.12)$$

So, the vertices of  $\triangle ABC$  in fig.

$$\mathbf{A} = \begin{pmatrix} 3.375 \\ 4.960 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 4 \\ 0 \end{pmatrix} \quad (2.0.13)$$

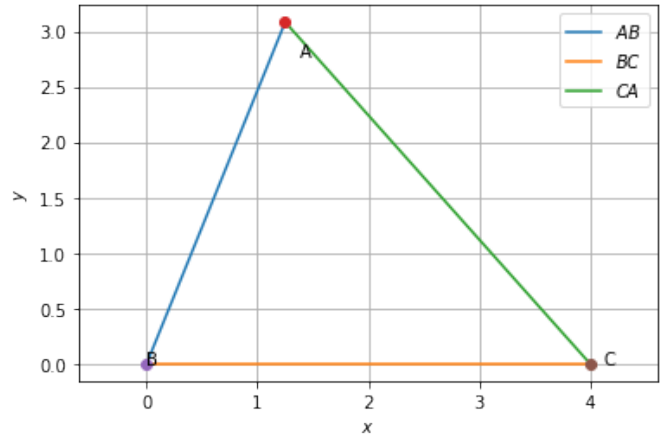


Fig. 0:  $\triangle ABC$