Assignment 1

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Download all python codes from

and latex-tikz codes from

1 Question No.2.7

In $\triangle ABC$, $a = 8$, $\angle B = 45°$ and $c - b = 3.5$. Sketch $\triangle ABC$.

2 SOLUTION

The vertex **A** can be expressed in *polar coordinate form* as

$$\mathbf{A} = c \begin{pmatrix} \cos\theta \\ \sin\theta \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} a \\ 0 \end{pmatrix}, \quad (2.0.1)$$

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

$$b^2 = a^2 + c^2 - 2ac\cos B \quad (2.0.2)$$

$$c^2 - b^2 + a^2 - 2ac\cos B = 0 \quad (2.0.3)$$

$$(c+b)(c-b) + 8^2 - 2(8)(\frac{1}{\sqrt{2}})c = 0 \quad \left(\because \angle B = 45°\right) \quad (2.0.4)$$

$$\frac{35}{10}(c+b) + 64 - \frac{1131}{100}c = 0 \quad (\because c - b = 3.5) \quad (2.0.5)$$

$$\implies 781c - 350b = 6400 \quad (2.0.6)$$

And we have,

$$c - b = 3.5 \quad (2.0.7)$$

$$\implies 10c - 10b = 35 \quad (2.0.8)$$

which can be expressed as the matrix equation

$$\begin{pmatrix} 781 & -350 \\ 10 & -10 \end{pmatrix} \begin{pmatrix} c \\ b \end{pmatrix} = \begin{pmatrix} 6400 \\ 35 \end{pmatrix} \quad (2.0.9)$$

Therefore,

$$\begin{pmatrix} c \\ b \end{pmatrix} = \begin{pmatrix} 12 \\ 8.5 \end{pmatrix} \quad (2.0.10)$$

So, the vertices of $\triangle ABC$ are

$$\mathbf{A} = 12 \begin{pmatrix} \cos 45 \\ \sin 45 \end{pmatrix} = \begin{pmatrix} 8.4 \\ 8.4 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 8 \\ 0 \end{pmatrix} \quad (2.0.11)$$
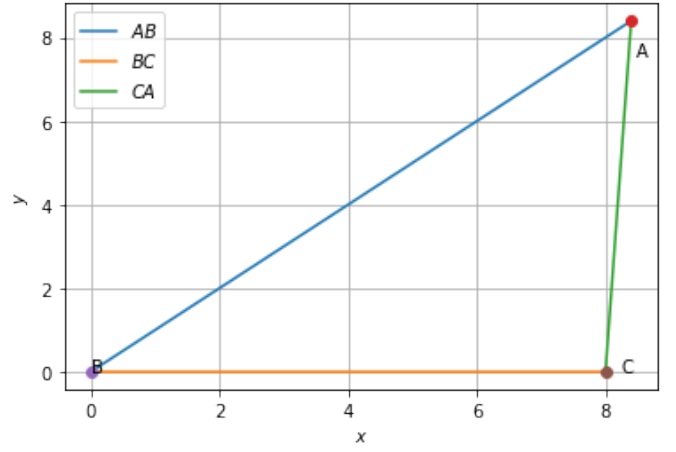
Plot of the $\triangle ABC$:

Fig. 2.1: $\triangle ABC$