Construction of triangle

AI24BTECH11006 - Bugada Roopansha

IIT Hyderabad

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Question

Construct a right triangle when one side is 3.5 cm, and the sum of the other side and the hypotenuse is 5.5 cm.

Solution: Parameters

Segment	**Norm**	**Angles**
$\|\|AB\|\|$	3.5	θ_1
$\|\|BC\|\|$	Distance between B and C	θ_2
$\|\|AC\|\|$	Distance between C and A	θ_3

Table: Input parameters

Solution: Calculations

Given:

$$||AB|| = 3.5\,\text{cm}, \quad ||BC|| + ||AC|| = 5.5\,\text{cm}$$

$$\implies ||AC|| = \sqrt{||AB||^2 + ||BC||^2}$$

$$\implies 5.5 - ||BC|| = \sqrt{(3.5)^2 + ||BC||^2}$$

Solution: Further Calculations

Expanding the equation:

$$\implies (5.5 - ||BC||)^2 = (3.5)^2 + ||BC||^2$$

Simplifying:

$$\implies ||BC|| = \frac{18}{11} \approx 1.64\,\text{cm}$$

$$\implies ||AC|| = 5.5 - ||BC|| \approx 3.86\,\text{cm}$$

Solution: Final Calculations

Using vectors:

$$\mathbf{u} = \begin{bmatrix} 3.5 \\ 0 \end{bmatrix}, \quad \mathbf{c} = \begin{bmatrix} 3.5 \\ 1.64 \end{bmatrix}$$

$$\cos(\theta) = \frac{12.25}{3.5 \cdot \sqrt{3.5^2 + 1.64^2}}$$

$$\theta \approx 34.89^\circ$$

Diagram

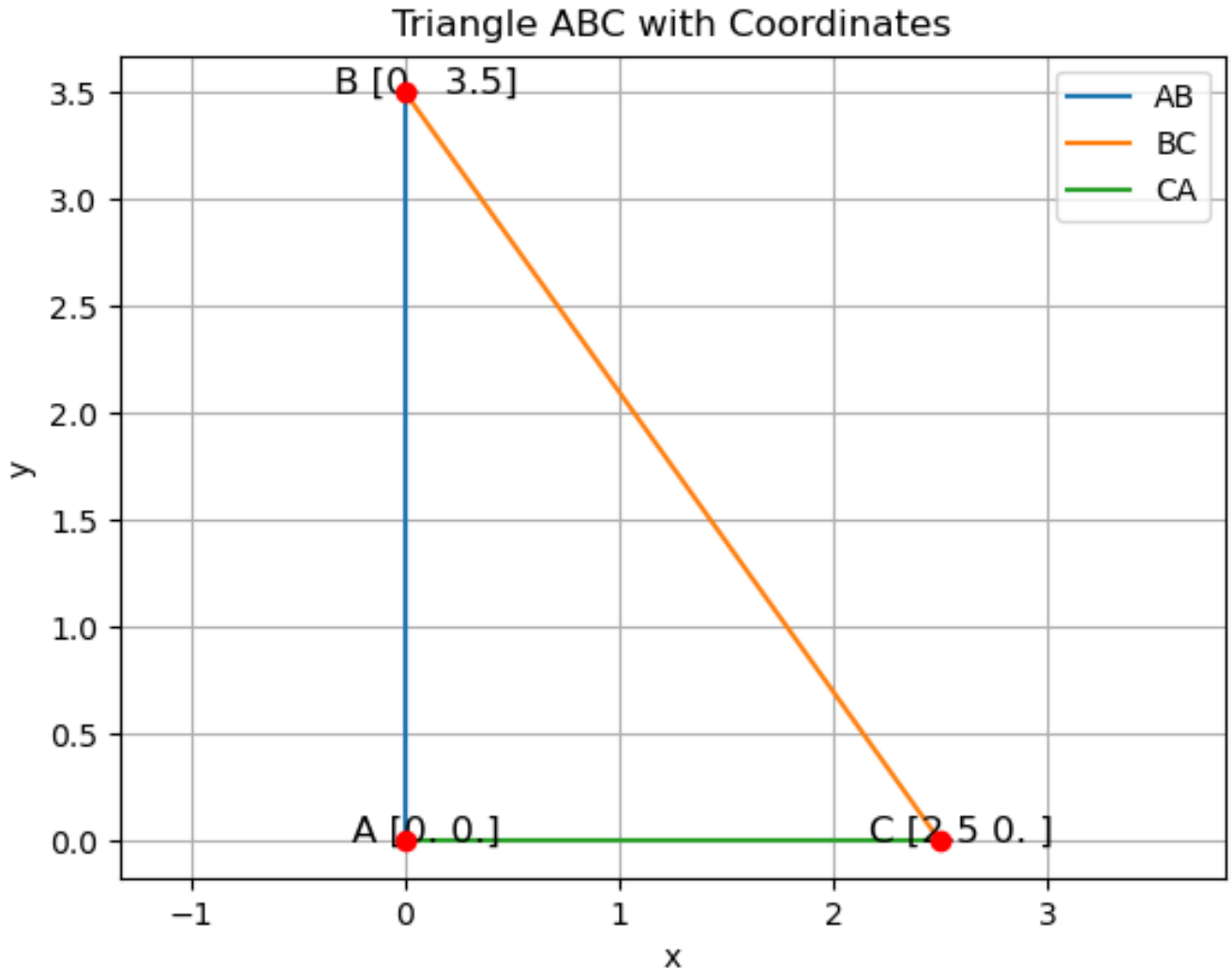

Figure: Right triangle with one side of 3.5 cm and the sum of the other side and hypotenuse equal to 5.5 cm.