2.5.3

EE25BTECH11049 - Sai Krishna Bakki

Question:
Show that the points (-2, 3), (8, 3), and (6, 7) are the vertices of a right-angled triangle.
Solution:
Given:

$$\mathbf{A} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 8 \\ 3 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 6 \\ 7 \end{pmatrix} \tag{0.1}$$

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} 10 \\ 0 \end{pmatrix} \tag{0.2}$$

$$\mathbf{C} - \mathbf{B} = \begin{pmatrix} -2 \\ 4 \end{pmatrix} \tag{0.3}$$

$$\mathbf{C} - \mathbf{A} = \begin{pmatrix} 8 \\ 4 \end{pmatrix} \tag{0.4}$$

For a right angle, the dot product of two sides must be zero,

$$(\mathbf{C} - \mathbf{A})^T (\mathbf{B} - \mathbf{A}) = (10)(8) + (0)(4) = 80 \neq 0 \tag{0.5}$$

$$(\mathbf{B} - \mathbf{A})^T (\mathbf{C} - \mathbf{B}) = (-2)(10) + (4)(0) = -20 \neq 0 \tag{0.6}$$

$$(\mathbf{C} - \mathbf{A})^T (\mathbf{C} - \mathbf{B}) = (-2)(8) + (4)(4) = 0 \tag{0.7}$$
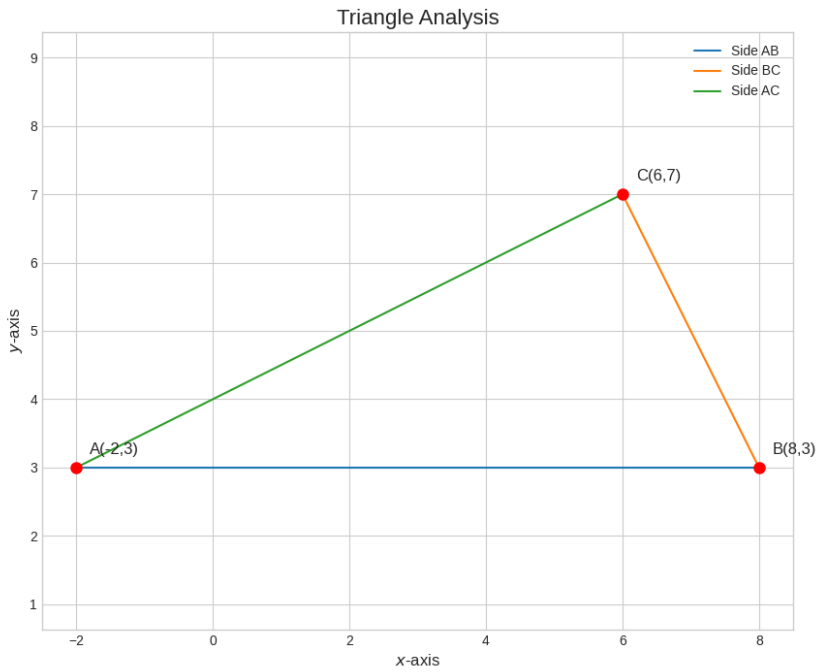
Hence $\triangle ABC$ is right angled at $\mathbf{C}$.

Fig. 0.1