

## 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:

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

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} 10 \\ 0 \end{pmatrix}, \mathbf{C} - \mathbf{B} = \begin{pmatrix} -2 \\ 4 \end{pmatrix}, \mathbf{C} - \mathbf{A} = \begin{pmatrix} 8 \\ 4 \end{pmatrix} \quad (0.2)$$

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

$$(\mathbf{C} - \mathbf{A})^T (\mathbf{B} - \mathbf{A}) = (10)(8) + (0)(4) = 80 \neq 0 \quad (0.3)$$

$$(\mathbf{B} - \mathbf{A})^T (\mathbf{C} - \mathbf{B}) = (-2)(10) + (4)(0) = -20 \neq 0 \quad (0.4)$$

$$(\mathbf{C} - \mathbf{A})^T (\mathbf{C} - \mathbf{B}) = (-2)(8) + (4)(4) = 0 \quad (0.5)$$

Hence  $\triangle ABC$  is right angled at  $\mathbf{C}$ .

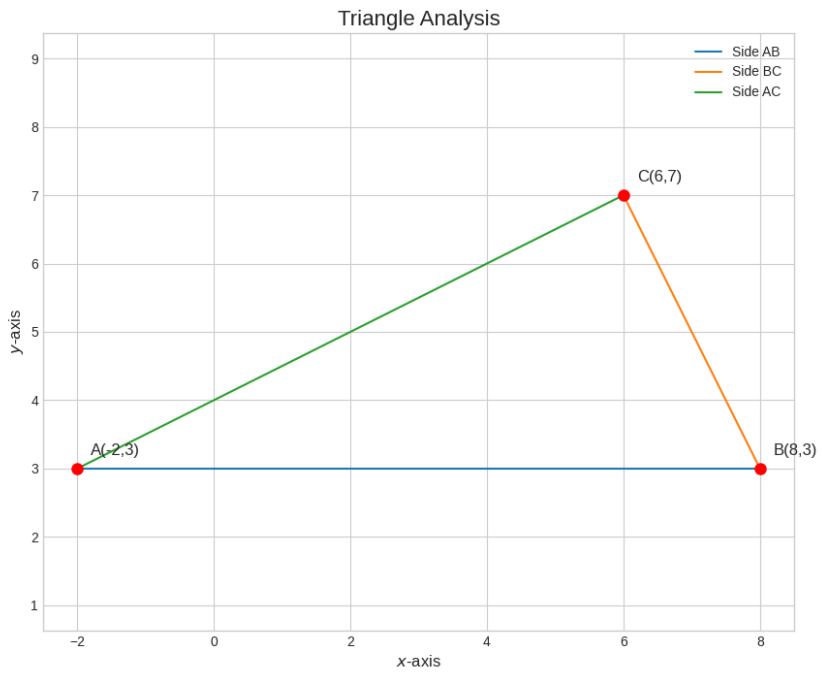


Fig. 0.1