MatGeo Assignment 1.2.14

AI25BTECH11008
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Question:
The fourth vertex D of a parallelogram $ABCD$ whose three vertices are $A(-2, 3)$, $B(6, 7)$ and $C(8, 3)$ is

Solution:
We solve this using **vector algebra**.

We are given three vertices:

$$A = \begin{pmatrix} -2 \\ 3 \end{pmatrix}, \quad B = \begin{pmatrix} 6 \\ 7 \end{pmatrix}, \quad C = \begin{pmatrix} 8 \\ 3 \end{pmatrix}.$$

Property: In a parallelogram, opposite sides are parallel and equal.

Thus,

$$\mathbf{D} = \mathbf{A} + \mathbf{C} - \mathbf{B}.$$

Substitute the values:

$$\mathbf{D} = \begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 8 \\ 3 \end{pmatrix} - \begin{pmatrix} 6 \\ 7 \end{pmatrix}.$$

$$\mathbf{D} = \begin{pmatrix} (-2 + 8 - 6) \\ (3 + 3 - 7) \end{pmatrix} = \begin{pmatrix} 0 \\ -1 \end{pmatrix}.$$
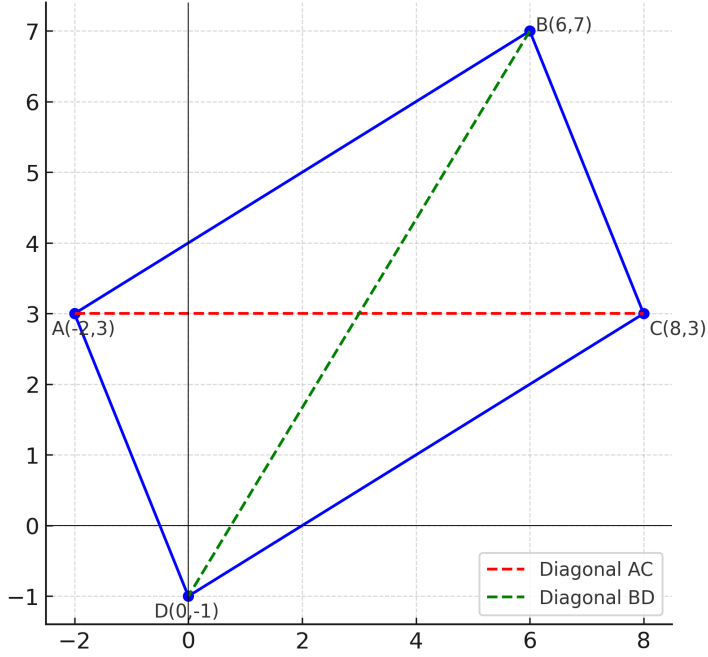
Hence,

$$\therefore D(0, -1)$$

Fig. 0.1: Parallelogram with vertices *A*, *B*, *C*, *D* using vector method

Thus, using vector addition, the fourth vertex is obtained as $D(0, -1)$, which matches the computational result.