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:
Let us solve the given equation theoretically and then verify the solution computationally.

We are given three vertices of a parallelogram:

$$A(-2,3),\ B(6,7),\ C(8,3).$$

Property: In a parallelogram, diagonals bisect each other.

Thus, midpoint of AC = midpoint of BD.

Let $D(x,y)$ be the fourth vertex.

$$\frac{1}{2}\begin{pmatrix}-2+8\\3+3\end{pmatrix} = \frac{1}{2}\begin{pmatrix}6+x\\7+y\end{pmatrix}$$

$$\begin{pmatrix}\frac{6}{2}\\\frac{6}{2}\end{pmatrix} = \begin{pmatrix}\frac{6+x}{2}\\\frac{7+y}{2}\end{pmatrix}$$

$$\begin{pmatrix}3\\3\end{pmatrix} = \begin{pmatrix}\frac{6+x}{2}\\\frac{7+y}{2}\end{pmatrix}$$

$$\frac{6+x}{2} = 3, \quad \frac{7+y}{2} = 3$$

$$x = 0, \quad y = -1$$

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

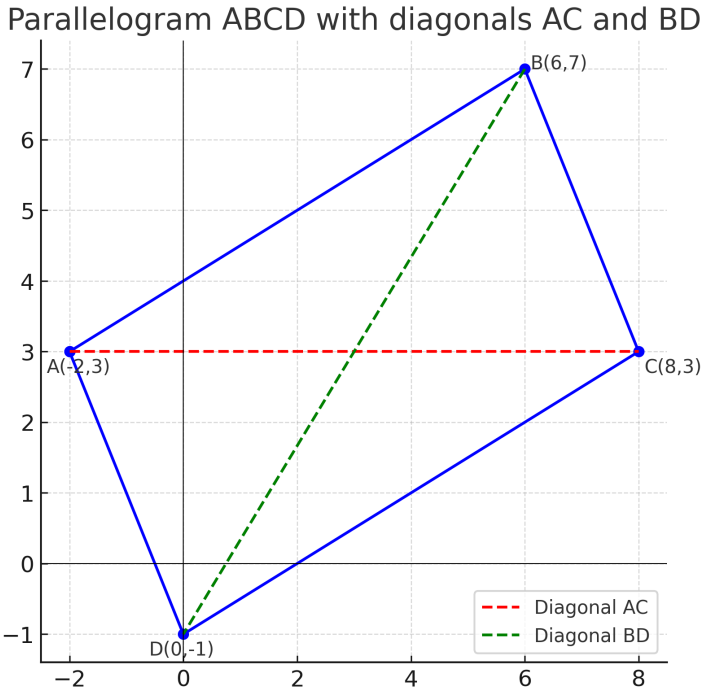

Fig. 0.1: The visual of the parallelogram with vertices A, B, C, D and diagonals shown

From the figure it is clearly verified that the theoretical solution matches with the computational solution.