

# 1.2.15

AI25BTECH11009-Dasu Harshith kumar

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## **Question 1.2.15**

Verify if the points

$$A(4, 3), \quad B(6, 4), \quad C(5, -6), \quad D(-3, 5)$$

are the vertices of a parallelogram.

### **Solution:**

A quadrilateral is a parallelogram if the diagonals bisect each other, i.e., the midpoints of diagonals  $AC$  and  $BD$  are the same.

Midpoint of diagonal  $AC$ :

$$\begin{aligned} M_{AC} &= \frac{A + C}{2} \\ &= \frac{1}{2} \begin{pmatrix} 4 + 5 \\ 3 + (-6) \end{pmatrix} \\ &= \begin{pmatrix} 4.5 \\ -1.5 \end{pmatrix} \end{aligned}$$

Midpoint of diagonal  $BD$ :

$$\begin{aligned} M_{BD} &= \frac{B + D}{2} \\ &= \frac{1}{2} \begin{pmatrix} 6 + (-3) \\ 4 + 5 \end{pmatrix} \\ &= \begin{pmatrix} 1.5 \\ 4.5 \end{pmatrix} \end{aligned}$$

Since

$$M_{AC} \neq M_{BD}$$

the diagonals do not bisect each other.

$\therefore A(4, 3), B(6, 4), C(5, -6), D(-3, 5)$  do not form a parallelogram.

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

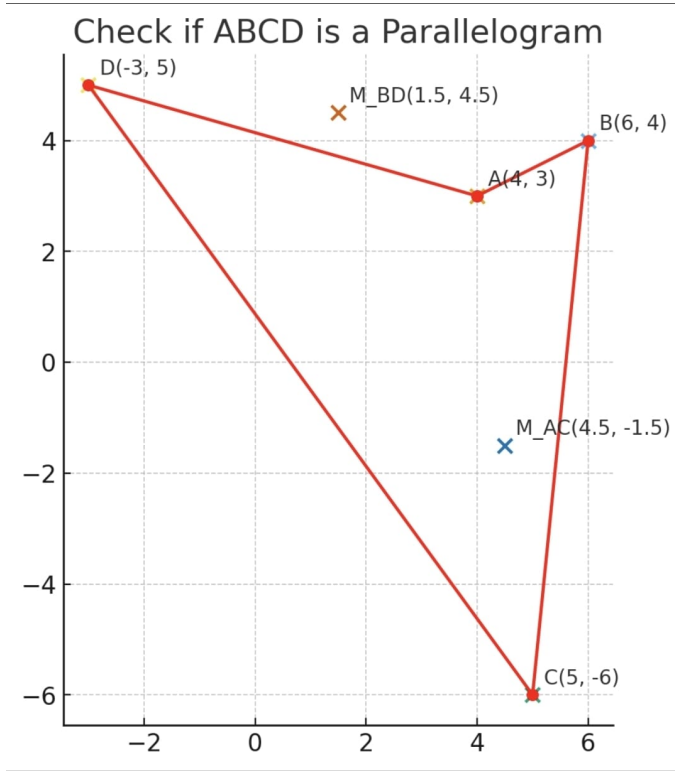


Fig. 0.1: Plot verifying if ABCD is a parallelogram