SM5083
Assignment 1

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1. CHAPTER II EXAMPLE II Q6

Show that (2, 4), (3, 0), (5, 3) and (4, 7) are the vertices of a Parallelogram. Solution:

Given (1)

$$\mathbf{A} = \begin{pmatrix}2\\4\end{pmatrix}, \mathbf{B} = \begin{pmatrix}3\\2\end{pmatrix}, \mathbf{C} = \begin{pmatrix}8\\4\end{pmatrix}, \mathbf{D} = \begin{pmatrix}7\\6\end{pmatrix} \quad (2)$$

ABCD can be a parallelogram if its opposite sides are parallel, i.e.

$$\mathbf{A} - \mathbf{B} = k_1(\mathbf{D} - \mathbf{C}) \text{ and } \mathbf{A} - \mathbf{D} = k_2(\mathbf{B} - \mathbf{C}) \quad (3)$$

$$\mathbf{A} - \mathbf{B} = \begin{pmatrix}-1\\2\end{pmatrix}, \quad \mathbf{D} - \mathbf{C} = \begin{pmatrix}-1\\2\end{pmatrix} \quad (4)$$

$$\mathbf{A} - \mathbf{D} = \begin{pmatrix}-5\\-2\end{pmatrix}, \quad \mathbf{B} - \mathbf{C} = \begin{pmatrix}-5\\-2\end{pmatrix} \quad (5)$$

From equations (4) and (5)

$$\mathbf{A} - \mathbf{B} = (1)(\mathbf{D} - \mathbf{C}) \text{ and}$$
$$\mathbf{A} - \mathbf{D} = (1)(\mathbf{B} - \mathbf{C}) \quad (6)$$

Hence the opposite sides AB || CD and AD || BC
$\therefore$ *ABCD* is a parallelogram as the opposite sides are parallel.
Python code at:

https://github.com/rrishabh27/SM5083/blob/main/Assignment_1/python_assignment_1.ipynb

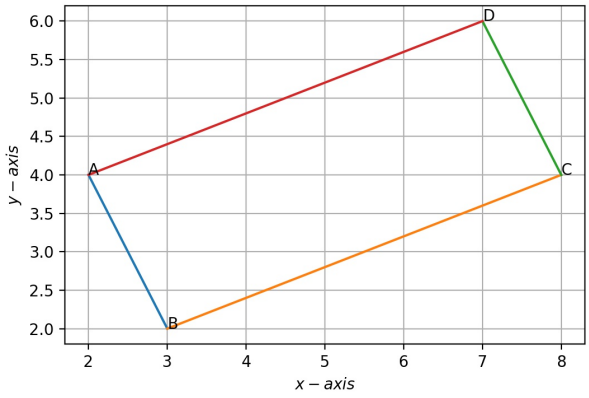

Fig. 0. The given points form a parallelogram