Line Assignment

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I. Question

Class 11, Exercise 10.1, Q(9): **Without using distance formula, show that points (– 2, – 1), (4, 0), (3, 3) and (–3, 2)are the vertices of a parallelogram.**

II. Solution

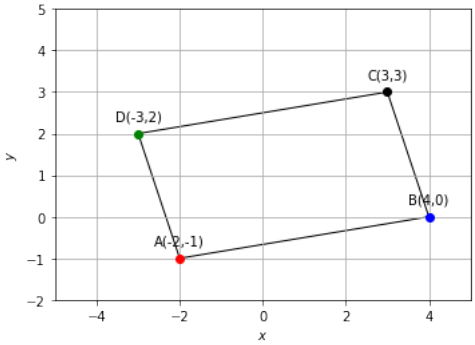

Figure 1: paralellogram ABCD

We can prove that the points are the vertices of a parallelogram if the direction vectors of opposite lines are equal
Consider figure I,where

$$\mathbf{A} = \begin{pmatrix} -2 \\ -1 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} 4 \\ 0 \end{pmatrix}$$

$$\mathbf{C} = \begin{pmatrix} 3 \\ 3 \end{pmatrix} \quad \mathbf{D} = \begin{pmatrix} -3 \\ 2 \end{pmatrix}$$

let the direction vector be

$$\mathbf{P} = \mathbf{B} - \mathbf{A} = \begin{pmatrix} 6 \\ 1 \end{pmatrix} \tag{1}$$

$$\mathbf{Q} = \mathbf{C} - \mathbf{D} = \begin{pmatrix} 6 \\ 1 \end{pmatrix} \tag{2}$$

$$\mathbf{R} = \mathbf{A} - \mathbf{C} = \begin{pmatrix} 1 \\ -3 \end{pmatrix} \tag{3}$$

$$\mathbf{S} = \mathbf{A} - \mathbf{D} = \begin{pmatrix} 1 \\ -3 \end{pmatrix} \tag{4}$$

from eq(1) and (2) $\mathbf{P} = \mathbf{Q}$
and form eq(3) and (4) $\mathbf{R} = \mathbf{S}$
since the direction vectors of opposite lines are same the points (– 2, – 1), (4, 0), (3, 3) and (–3, 2) forms the vertices of a parallelogram

Construction

Symbol	Value	Description
A	$\begin{pmatrix} -2 \\ -1 \end{pmatrix}$	Vertex A
B	$\begin{pmatrix} 4 \\ 0 \end{pmatrix}$	Vertex B
C	$\begin{pmatrix} 3 \\ 3 \end{pmatrix}$	Vertex C
D	$\begin{pmatrix} -3 \\ 2 \end{pmatrix}$	Vertex D
P	$\begin{pmatrix} 1 \\ 6 \end{pmatrix}$	vector AB
Q	$\begin{pmatrix} 1 \\ 6 \end{pmatrix}$	vector DC
R	$\begin{pmatrix} 1 \\ -3 \end{pmatrix}$	vector BC
S	$\begin{pmatrix} 1 \\ -3 \end{pmatrix}$	vector AD

Get the python code of the figures from

https://github.com/kkousar/KOUSAR_FWC/blob/m