QUIZ 4

Shristy Sharma (EE22BNITS11001)

1 PROBLEM 1

1. Without using distance formula, show that points $\mathbf{A} = \begin{pmatrix}-2\\-1\end{pmatrix}$, $\mathbf{B} = \begin{pmatrix}4\\0\end{pmatrix}$, $\mathbf{C} = \begin{pmatrix}3\\3\end{pmatrix}$ and $\mathbf{D} = \begin{pmatrix}-3\\2\end{pmatrix}$ are the vertices of a parallelogram.

SOLUTION:

Given,

$$\mathbf{A} = \begin{pmatrix}-2\\-1\end{pmatrix}, \mathbf{B} = \begin{pmatrix}4\\0\end{pmatrix}, \mathbf{C} = \begin{pmatrix}3\\3\end{pmatrix}, \mathbf{D} = \begin{pmatrix}-3\\2\end{pmatrix} \tag{1.0.1}$$

To show that the given points are the vertices of a parallelogram, we need to show the following;

1) $\mathbf{A} - \mathbf{B} = \mathbf{D} - \mathbf{C}$
2) $\mathbf{A} - \mathbf{D} = \mathbf{B} - \mathbf{C}$

So,

$$\mathbf{A} - \mathbf{B} = \begin{pmatrix}-2\\-1\end{pmatrix} - \begin{pmatrix}4\\0\end{pmatrix} \tag{1.0.2}$$

$$= \begin{pmatrix}-6\\-1\end{pmatrix} \tag{1.0.3}$$

$$\mathbf{D} - \mathbf{C} = \begin{pmatrix}-3\\2\end{pmatrix} - \begin{pmatrix}3\\3\end{pmatrix} \tag{1.0.4}$$

$$= \begin{pmatrix}-6\\-1\end{pmatrix} \tag{1.0.5}$$

$$\mathbf{A} - \mathbf{D} = \begin{pmatrix}-2\\-1\end{pmatrix} - \begin{pmatrix}-3\\2\end{pmatrix} \tag{1.0.6}$$

$$= \begin{pmatrix}1\\-3\end{pmatrix} \tag{1.0.7}$$

$$\mathbf{B} - \mathbf{C} = \begin{pmatrix}4\\0\end{pmatrix} - \begin{pmatrix}3\\3\end{pmatrix} \tag{1.0.8}$$

$$= \begin{pmatrix}1\\-3\end{pmatrix} \tag{1.0.9}$$

Therefore, we can now say that the given points are the vertices of a parallelogram since both the sides of the quadrilateral are parallel to each other.

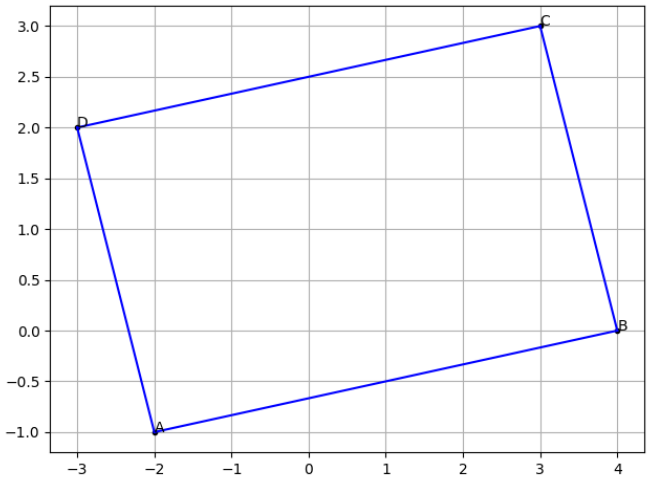

Fig. 2: Plot of parallelogram *ABCD*