Assignment 1

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Download all python codes from

https://github.com/rubeenaafreen20/EE5600AI−ML/tree/master/Codes

and latex codes from

https://github.com/rubeenaafreen20/EE5600AI−ML

1 Problem

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

2 Explanation

Let points of quadrilateral be A, B, C, D such that,

$$A = \begin{pmatrix}-2\\-1\end{pmatrix}, B = \begin{pmatrix}4\\0\end{pmatrix}, C = \begin{pmatrix}3\\3\end{pmatrix}, D = \begin{pmatrix}-3\\2\end{pmatrix} \tag{2.0.1}$$

We have vector equations for each side as:

$$\boldsymbol{AB} = A - B = \begin{pmatrix}-2\\-1\end{pmatrix} - \begin{pmatrix}4\\0\end{pmatrix} = \begin{pmatrix}-6\\-1\end{pmatrix} \tag{2.0.2}$$

$$\boldsymbol{BC} = B - C = \begin{pmatrix}4\\0\end{pmatrix} - \begin{pmatrix}3\\3\end{pmatrix} = \begin{pmatrix}1\\-3\end{pmatrix} \tag{2.0.3}$$

$$\boldsymbol{DC} = D - C = D = \begin{pmatrix}-3\\2\end{pmatrix} - \begin{pmatrix}3\\3\end{pmatrix} = \begin{pmatrix}-6\\-1\end{pmatrix} \tag{2.0.4}$$

and

$$\boldsymbol{AD} = A - D = A = \begin{pmatrix}-2\\-1\end{pmatrix} - \begin{pmatrix}-3\\2\end{pmatrix} = \begin{pmatrix}1\\-3\end{pmatrix} \tag{2.0.5}$$

3 Proof

Since,

$$\boldsymbol{AB} = \boldsymbol{DC} \tag{3.0.1}$$

and,

$$\boldsymbol{BC} = \boldsymbol{AD} \tag{3.0.2}$$

We can say that opposite edges of the quadrilateral are parallel.
Hence, ABCD is a parallelogram

4 Result

Plot of quadrilateral obtained from Python code is shown below.

Fig. 1: Plot of parallelogram ABCD