

Assignment

Sujal - AI20BTECH11020

Download all latex codes from

https://github.com/sujal100/EE3900/blob/main/Chg_pbl_1/Chg_pbl_1.tex

Download all python codes from

https://github.com/sujal100/EE3900/blob/main/Chg_pbl_1/codes/code.py

1 PROBLEM

Devise a matrix approach to find if the points A,B,C,D are vertices of a parallelogram.

2 SOLUTION

If given points are discrete than using diagonal property of parallelogram which is mid-points of diagonal of parallelogram are coincidence we can prove that given point are vertices of a parallelogram. For example, we have given points,

$$\mathbf{A} = \begin{pmatrix} 1 \\ 3 \\ 2 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 4 \\ 5 \\ 0 \end{pmatrix}, \mathbf{C} = \begin{pmatrix} 2 \\ 0 \\ 4 \end{pmatrix}, \mathbf{D} = \begin{pmatrix} 5 \\ 2 \\ 2 \end{pmatrix} \quad (2.0.1)$$

than we calculated all mid-points of each line formed by this points as

$$\mathbf{P} = \frac{\mathbf{A} + \mathbf{B}}{2} = \begin{pmatrix} 2.5 \\ 4 \\ 1 \end{pmatrix}, \quad (2.0.2)$$

$$\mathbf{Q} = \frac{\mathbf{B} + \mathbf{C}}{2} = \begin{pmatrix} 3 \\ 2.5 \\ 2 \end{pmatrix}, \quad (2.0.3)$$

$$\mathbf{R} = \frac{\mathbf{C} + \mathbf{D}}{2} = \begin{pmatrix} 3.5 \\ 1 \\ 3 \end{pmatrix}, \quad (2.0.4)$$

$$\mathbf{S} = \frac{\mathbf{D} + \mathbf{A}}{2} = \begin{pmatrix} 3 \\ 2.5 \\ 2 \end{pmatrix}, \quad (2.0.5)$$

$$\mathbf{T} = \frac{\mathbf{A} + \mathbf{C}}{2} = \begin{pmatrix} 1.5 \\ 1.5 \\ 3 \end{pmatrix}, \quad (2.0.6)$$

$$\mathbf{U} = \frac{\mathbf{B} + \mathbf{D}}{2} = \begin{pmatrix} 4.5 \\ 3.5 \\ 1 \end{pmatrix} \quad (2.0.7)$$

Here, \mathbf{Q} is equal to \mathbf{S} so that vertex \mathbf{B} is opposite to \mathbf{C} and \mathbf{A} is opposite to \mathbf{D} and also this prove that $\mathbf{A}, \mathbf{B}, \mathbf{C}$ and \mathbf{D} are vertices of a parallelogram.

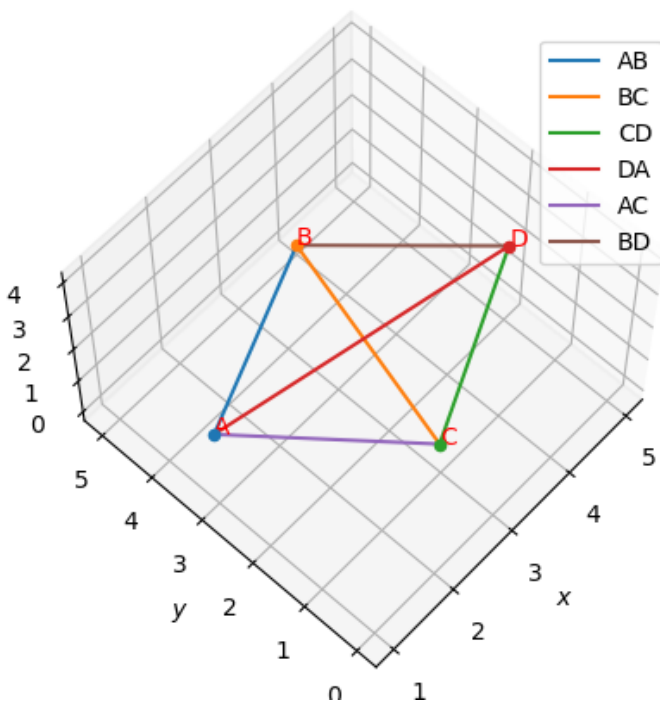


Fig. 0: Plot of the line