

Assignment 3.1

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Download the python code, latex file and the pdf doc from

<https://github.com/Rishab9991/EE5609/tree/master/Assignments/Assignment3.1>

Solution:

Consider Fig. 1

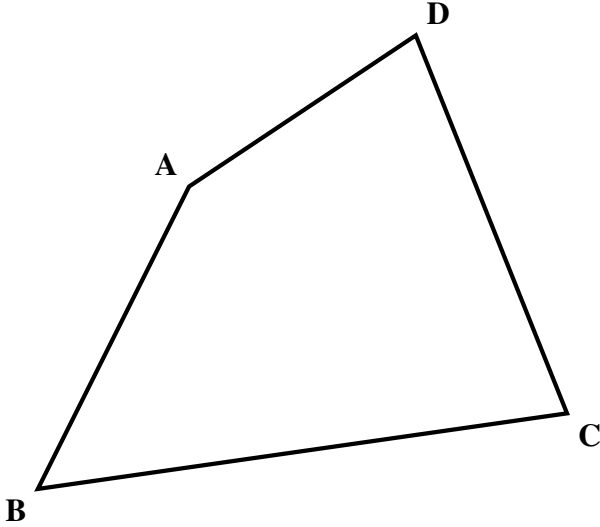


Fig. 1: Quadrilateral ABCD

AB is the smallest and CD is the largest side in the quadrilateral.

The sides AB, BC, CD and DA of the quadrilateral will be represented as direction vectors \mathbf{m}_{AB} , \mathbf{m}_{BC} , \mathbf{m}_{CD} and \mathbf{m}_{DA} which are obtained from Vectors \mathbf{A} , \mathbf{B} , \mathbf{C} and \mathbf{D} which belong in the \mathbb{R}^2 space.

$$\mathbf{m}_{AB} = \mathbf{A} - \mathbf{B}$$

$$\mathbf{m}_{BC} = \mathbf{B} - \mathbf{C}$$

$$\mathbf{m}_{CD} = \mathbf{C} - \mathbf{D}$$

$$\mathbf{m}_{DA} = \mathbf{D} - \mathbf{A}$$

(1) From adding (11) and (13) on LHS and RHS separately, we get

$$(2) \quad \angle B > \angle D \quad (14)$$

(4) From (9) and (14)
Hence Proved.

Consider Fig. 1 with diagonal AC. In Triangle ABC,

$$\|\mathbf{B} - \mathbf{C}\| > \|\mathbf{A} - \mathbf{B}\| \quad (5)$$

$$\Rightarrow \angle BAC > \angle ACB \quad (6)$$

Similarly, In Triangle CDA

$$\|\mathbf{C} - \mathbf{D}\| > \|\mathbf{D} - \mathbf{A}\| \quad (7)$$

$$\Rightarrow \angle CAD > \angle DCA \quad (8)$$

Where $\|\mathbf{A} - \mathbf{B}\|$, $\|\mathbf{B} - \mathbf{C}\|$, $\|\mathbf{C} - \mathbf{D}\|$, $\|\mathbf{D} - \mathbf{A}\|$ are magnitudes of sides AB, BC, CD and DA.

From adding (6) and (8) on LHS and RHS separately, we get

$$\angle A > \angle C \quad (9)$$

Consider Fig. 1 with diagonal BD. In Triangle BAD,

$$\|\mathbf{A} - \mathbf{D}\| > \|\mathbf{A} - \mathbf{B}\| \quad (10)$$

$$\Rightarrow \angle ABD > \angle BDA \quad (11)$$

Similarly, In Triangle DCB

$$\|\mathbf{C} - \mathbf{D}\| > \|\mathbf{B} - \mathbf{C}\| \quad (12)$$

$$\Rightarrow \angle CBD > \angle CDB \quad (13)$$