Matrix Theory (EE5609)
Assignment-3

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***Abstract*—This document contains the proof on Quadrilateral.**

Download latex-tikz codes from

https://github.com/EE20RESCH11008/Matrix−Theory/tree/master/Assignment−3

1 Problem

Line segments AD and BC intersect at O and form △OAB and △ODC. $\angle B < \angle A$ and $\angle C < \angle D$. Show that $AD < BC$.

2 Solution

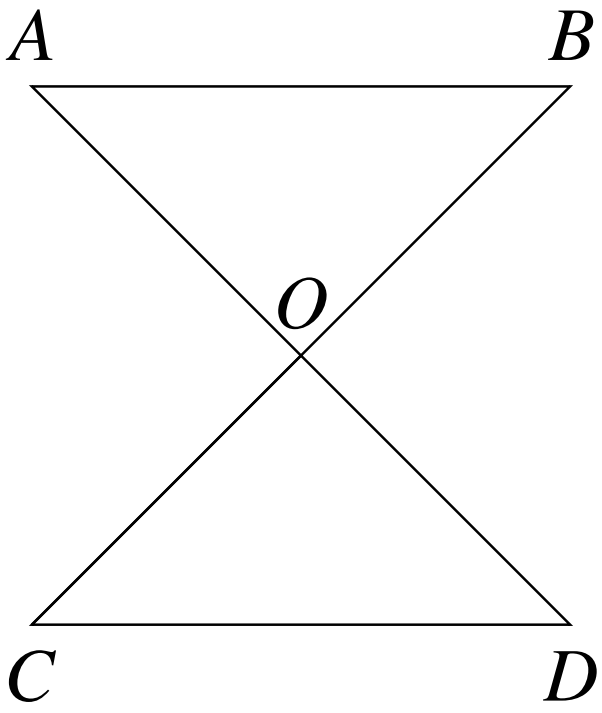

Fig. 1: Quadrilateral with $\angle B < \angle A$ and $\angle C < \angle D$

Given that

$$\angle B < \angle A \tag{2.0.1}$$

$$\angle C < \angle D \tag{2.0.2}$$

It is known that in a Triangle, the side opposite to the largest angle is the largest.
From the $\triangle OAB$,

$$\|\mathbf{A}-\mathbf{O}\|^2 < \|\mathbf{B}-\mathbf{O}\|^2 \tag{2.0.3}$$

Similarly in $\triangle OCD$,

$$\|\mathbf{D}-\mathbf{O}\|^2 < \|\mathbf{C}-\mathbf{O}\|^2 \tag{2.0.4}$$

From equations (2.0.3) and (2.0.4) we get,

$$\|\mathbf{D}-\mathbf{O}\|^2 + \|\mathbf{A}-\mathbf{O}\|^2 < \|\mathbf{C}-\mathbf{O}\|^2 + \|\mathbf{B}-\mathbf{O}\|^2 \tag{2.0.5}$$

$$\implies \|\mathbf{D}-\mathbf{A}\|^2 < \|\mathbf{C}-\mathbf{B}\|^2 \tag{2.0.6}$$

$$\implies AD < BC \tag{2.0.7}$$

Hence Proved.