

EE5609: Matrix Theory

Assignment-3

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Abstract—This document contains a proof for a theorem related to triangle.

Download the python codes from

<https://github.com/pranaya14014/EE5609/tree/master/Assignment3/code>

and latex-tikz codes from

<https://github.com/pranaya14014/EE5609/tree/master/Assignment3>

Using (2.0.3) and (2.0.4) in the above equation,

$$\frac{\mathbf{A} + \mathbf{B}}{2} - \mathbf{E} = k(\mathbf{B} - \mathbf{C}) \quad (2.0.6)$$

$$\frac{\mathbf{A}}{2} + \frac{1}{2}\mathbf{B} - \mathbf{E} = k\mathbf{B} - k\mathbf{C} \quad (2.0.7)$$

Equating \mathbf{B} on both sides we get $k = \frac{1}{2}$
Substituting k value in (2.0.7)

$$\frac{\mathbf{A}}{2} - \mathbf{E} = -\frac{1}{2}\mathbf{C} \quad (2.0.8)$$

$$\mathbf{E} = \frac{\mathbf{A} + \mathbf{C}}{2} \quad (2.0.9)$$

Hence Proved

1 PROBLEM

A line through the mid-point of a side of a triangle parallel to another side bisects the third side.

2 SOLUTION

Given: Consider a $\triangle ABC$ with sides AB , BC , AC . Let \mathbf{D} be the mid-point of AB , \mathbf{E} be a point on AC and $DE \parallel BC$

Need to prove: $\mathbf{E} = \frac{\mathbf{A} + \mathbf{C}}{2}$

Proof:

$$\mathbf{D} = \frac{\mathbf{A} + \mathbf{B}}{2} \quad (2.0.1)$$

$$DE \parallel BC \quad (2.0.2)$$

Let direction vectors be \mathbf{m}_{DE} and \mathbf{m}_{BC} for line segment DE and BC respectively.

$$\mathbf{m}_{DE} = \mathbf{D} - \mathbf{E} = \frac{\mathbf{A} + \mathbf{B}}{2} - \mathbf{E} \quad (2.0.3)$$

$$\mathbf{m}_{BC} = \mathbf{B} - \mathbf{C} \quad (2.0.4)$$

From (2.0.2) we can write the following with k being a real value,

$$\mathbf{m}_{DE} = k\mathbf{m}_{BC} \quad (2.0.5)$$

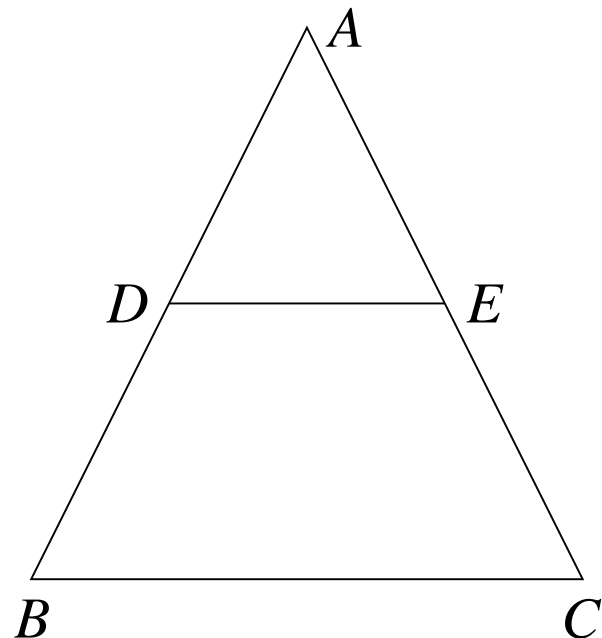


Fig. 0: Triangle