

Assignment 4

Utkarsh Shashikant Surwade

Abstract—This document solves a question based on triangle. similarly,

All the codes for the figure in this document can be found at

https://github.com/utkarshsurwade/Matrix_Theory_EE5609/tree/master/Assignment4

$$(\mathbf{A} - \mathbf{C}) + (\mathbf{C} - \mathbf{E}) = (\mathbf{A} - \mathbf{E}) \quad (2.0.4)$$

$$\therefore (\mathbf{A} - \mathbf{C}) = (\mathbf{A} - \mathbf{E}) - (\mathbf{C} - \mathbf{E}) \quad (2.0.5)$$

$$\therefore (\mathbf{A} - \mathbf{C}) = \frac{1}{2}(\mathbf{A} - \mathbf{B}) - (\mathbf{C} - \mathbf{E}) \quad (2.0.6)$$

Since $AB = AC$

$$\therefore (AB)^2 = (AC)^2$$

Solving LHS:

$$\therefore (\mathbf{A} - \mathbf{B})^2 \quad (2.0.7)$$

$$\left(\frac{1}{2}(\mathbf{A} - \mathbf{C}) - (\mathbf{B} - \mathbf{F})\right)^2 \quad (2.0.8)$$

$$\frac{1}{4}(\mathbf{A} - \mathbf{C})^2 + (\mathbf{B} - \mathbf{F})^2 - (\mathbf{A} - \mathbf{C})^T(\mathbf{B} - \mathbf{F}) \quad (2.0.9)$$

Solving RHS:

$$\therefore (\mathbf{A} - \mathbf{C})^2 \quad (2.0.10)$$

$$\left(\frac{1}{2}(\mathbf{A} - \mathbf{B}) - (\mathbf{C} - \mathbf{E})\right)^2 \quad (2.0.11)$$

$$\frac{1}{4}(\mathbf{A} - \mathbf{B})^2 + (\mathbf{C} - \mathbf{E})^2 - (\mathbf{A} - \mathbf{B})^T(\mathbf{C} - \mathbf{E}) \quad (2.0.12)$$

Comparing LHS AND RHS

$$\|\mathbf{B} - \mathbf{F}\| = \|\mathbf{C} - \mathbf{E}\|$$

Hence, BF is equal to CE

1 PROBLEM

E and F are respectively the mid-points of equal sides AB and AC of $\triangle ABC$. Show that $BF = CE$.

2 SOLUTION

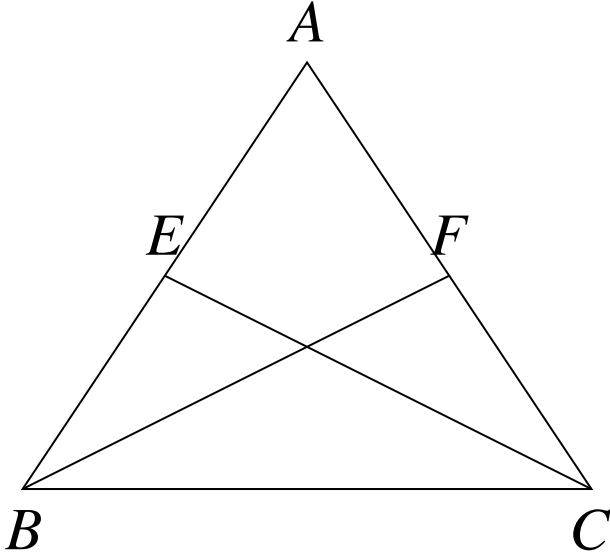


Fig. 1: Isosceles Triangle with mid-points E and F on equal sides

According to figure:

$$(\mathbf{A} - \mathbf{B}) + (\mathbf{B} - \mathbf{F}) = (\mathbf{A} - \mathbf{F}) \quad (2.0.1)$$

$$\therefore (\mathbf{A} - \mathbf{B}) = (\mathbf{A} - \mathbf{F}) - (\mathbf{B} - \mathbf{F}) \quad (2.0.2)$$

$$\therefore (\mathbf{A} - \mathbf{B}) = \frac{1}{2}(\mathbf{A} - \mathbf{C}) - (\mathbf{B} - \mathbf{F}) \quad (2.0.3)$$