

Assignment 4

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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

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

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

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

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

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

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

$$\begin{aligned} \|(\mathbf{A} - \mathbf{B})\|^2 + \frac{1}{4} \|(\mathbf{A} - \mathbf{C})\|^2 - (\mathbf{A} - \mathbf{C})^T (\mathbf{A} - \mathbf{B}) &= \\ \|(\mathbf{A} - \mathbf{C})\|^2 + \frac{1}{4} \|(\mathbf{A} - \mathbf{B})\|^2 - (\mathbf{A} - \mathbf{B})^T (\mathbf{A} - \mathbf{C}) & \end{aligned} \quad (2.0.8)$$

$$\begin{aligned} \left(\frac{1}{2}(\mathbf{A} - \mathbf{C}) - (\mathbf{A} - \mathbf{B})\right)^T \left(\frac{1}{2}(\mathbf{A} - \mathbf{C}) - (\mathbf{A} - \mathbf{B})\right) &= \\ \left(\frac{1}{2}(\mathbf{A} - \mathbf{B}) - (\mathbf{A} - \mathbf{C})\right)^T \left(\frac{1}{2}(\mathbf{A} - \mathbf{B}) - (\mathbf{A} - \mathbf{C})\right) & \end{aligned} \quad (2.0.9)$$

$$\|(\mathbf{B} - \mathbf{F})\|^2 = \|(\mathbf{C} - \mathbf{E})\|^2 \quad (2.0.10)$$

$$\therefore \|\mathbf{B} - \mathbf{F}\| = \|\mathbf{C} - \mathbf{E}\| \quad (2.0.11)$$

Hence, BF is equal to CE

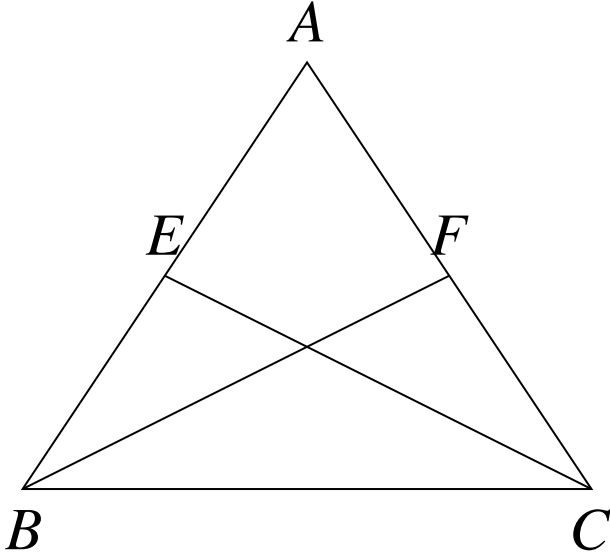


Fig. 1: Isosceles Triangle with mid-points E and F on equal sides

According to figure:

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

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

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