

# Assignment 6

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**Abstract**—This document solves a question based on triangle.

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

[https://github.com/Adarsh1310/EE5609/tree/master/Assignment\\_6](https://github.com/Adarsh1310/EE5609/tree/master/Assignment_6)

Let  $\mathbf{m}_{AB}$  and  $\mathbf{m}_{CF}$  be direction vector of side  $\mathbf{AB}$  and altitude  $\mathbf{CF}$  respectively.

$$\mathbf{m}_{AB} = \mathbf{A} - \mathbf{B} \quad (2.0.5)$$

$$\mathbf{m}_{CF} = \mathbf{C} - \mathbf{F} \quad (2.0.6)$$

Here,  $\mathbf{CF} \perp \mathbf{AB}$  because  $\mathbf{CF}$  is the altitude to side  $\mathbf{AB}$ . So,

$$\mathbf{m}_{AB}\mathbf{m}_{CF} = 0 \quad (2.0.7)$$

$$(\mathbf{A} - \mathbf{B})(\mathbf{C} - \mathbf{F}) = 0 \quad (2.0.8)$$

Comparing (2.0.4) and (2.0.8)

$$(\mathbf{A} - \mathbf{C})(\mathbf{B} - \mathbf{E}) = (\mathbf{A} - \mathbf{B})(\mathbf{C} - \mathbf{F}) \quad (2.0.9)$$

$$(\mathbf{B} - \mathbf{E}) = (\mathbf{C} - \mathbf{F}) [\because \mathbf{m}_{AB} = \mathbf{m}_{AC}] \quad (2.0.10)$$

$$\mathbf{m}_{BE} = \mathbf{m}_{CF} \quad (2.0.11)$$

Hence, we can say that these altitudes are equal.

## 1 PROBLEM

$\triangle ABC$  is an isosceles triangle in which altitudes  $\mathbf{BE}$  and  $\mathbf{CF}$  are drawn to equal sides  $\mathbf{AC}$  and  $\mathbf{AB}$  respectively. Show that these altitudes are equal.

## 2 SOLUTION

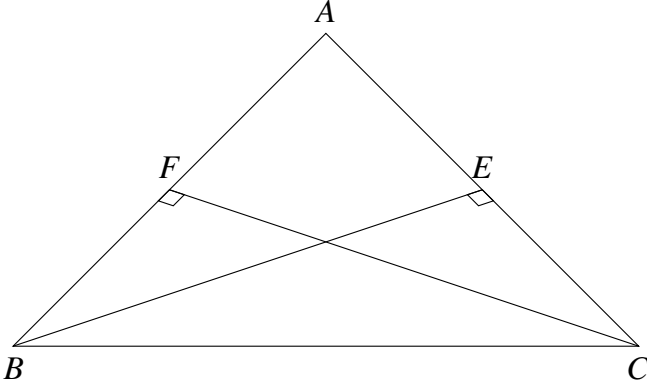


Fig. 1: Isosceles Triangle with BE and CF as altitude

Let  $\mathbf{m}_{AC}$  and  $\mathbf{m}_{BE}$  be direction vector of side  $\mathbf{AC}$  and altitude  $\mathbf{BE}$  respectively.

$$\mathbf{m}_{AC} = \mathbf{A} - \mathbf{C} \quad (2.0.1)$$

$$\mathbf{m}_{BE} = \mathbf{B} - \mathbf{E} \quad (2.0.2)$$

Here,  $\mathbf{BE} \perp \mathbf{AC}$  because  $\mathbf{BE}$  is the altitude to side  $\mathbf{AC}$ . So,

$$\mathbf{m}_{AC}\mathbf{m}_{BE} = 0 \quad (2.0.3)$$

$$(\mathbf{A} - \mathbf{C})(\mathbf{B} - \mathbf{E}) = 0 \quad (2.0.4)$$