

## 4.13.10

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# Question

Vertices of a triangle are:

$$\mathbf{A} = \begin{pmatrix} -1 \\ -7 \end{pmatrix}, \quad \mathbf{B} = \begin{pmatrix} 5 \\ 1 \end{pmatrix}, \quad \mathbf{C} = \begin{pmatrix} 1 \\ 10 \end{pmatrix}.$$

Find the equation of the bisector of  $\angle ABC$ .

# Solution

Define vectors:

$$\mathbf{D} = \mathbf{A} - \mathbf{B} = \begin{pmatrix} -6 \\ -8 \end{pmatrix}, \quad \mathbf{E} = \mathbf{C} - \mathbf{B} = \begin{pmatrix} -4 \\ 9 \end{pmatrix}.$$

Magnitudes:

$$\|\mathbf{D}\| = 10, \quad \|\mathbf{E}\| = \sqrt{97}.$$

# Solution

Normalized vectors:

$$\mathbf{e}_D = \frac{1}{10} \begin{pmatrix} -6 \\ -8 \end{pmatrix}, \quad \mathbf{e}_E = \frac{1}{\sqrt{97}} \begin{pmatrix} -4 \\ 9 \end{pmatrix}.$$

Angle bisector vector:

$$\mathbf{L} = \mathbf{e}_D + \mathbf{e}_E = \begin{pmatrix} -\frac{6}{10} - \frac{4}{\sqrt{97}} \\ -\frac{8}{10} + \frac{9}{\sqrt{97}} \end{pmatrix}.$$

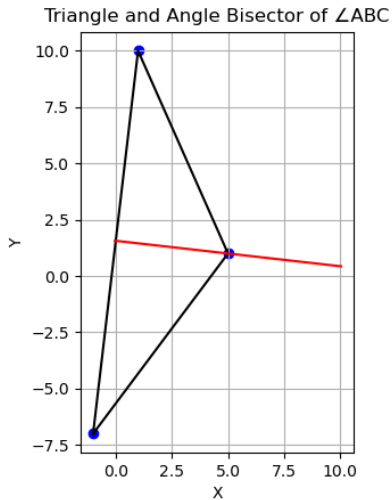
# Solution

Line along bisector passing through **B**:

$$\mathbf{x} = \mathbf{B} + \lambda \mathbf{L}, \quad \lambda \in \mathbb{R}.$$

Expanded:

$$\mathbf{x} = \begin{pmatrix} 5 \\ 1 \end{pmatrix} + \lambda \begin{pmatrix} -\frac{6}{10} - \frac{4}{\sqrt{97}} \\ -\frac{8}{10} + \frac{9}{\sqrt{97}} \end{pmatrix}.$$



For Codes, refer to the URL below:

[https://github.com/Aditya-Mishra11005/ee1030-2025/tree/  
temp/ee25btech11005/matgeo/4.13.10/Codes](https://github.com/Aditya-Mishra11005/ee1030-2025/tree/temp/ee25btech11005/matgeo/4.13.10/Codes)