

Probability Assignment

EE22BTECH11022 - Garikapati Sai Harshith

Question: Find the intersection \mathbf{G} of BE and CF

Solution: \mathbf{A} , \mathbf{B} and \mathbf{C} are vertices of triangle:

$$\mathbf{A} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} \quad (1)$$

$$\mathbf{B} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} \quad (2)$$

$$\mathbf{C} = \begin{pmatrix} -3 \\ -5 \end{pmatrix} \quad (3)$$

Since \mathbf{E} and \mathbf{F} are midpoints of CA and AB ,

$$\mathbf{E} = \frac{\mathbf{A} + \mathbf{C}}{2} \quad (4)$$

$$= \begin{pmatrix} -1 \\ -3 \end{pmatrix} \quad (5)$$

$$\mathbf{F} = \frac{\mathbf{B} + \mathbf{A}}{2} \quad (6)$$

$$= \begin{pmatrix} -\frac{3}{2} \\ \frac{5}{2} \end{pmatrix} \quad (7)$$

The line BE in vector form is given by

$$(3 \ 1)\mathbf{x} = (-6) \quad (8)$$

The line CF in vector form is given by

$$(5 \ -1)\mathbf{x} = (-10) \quad (9)$$

From (8) and (9) the augmented matrix is:

$$\begin{pmatrix} 3 & 1 & -6 \\ 5 & -1 & -10 \end{pmatrix} \quad (10)$$

Solve for \mathbf{x} using Gauss-Elimination method:

$$\begin{pmatrix} 3 & 1 & -6 \\ 5 & -1 & -10 \end{pmatrix} \xrightarrow{R_1 \leftarrow R_1 + R_2} \begin{pmatrix} 8 & 0 & -16 \\ 5 & -1 & -10 \end{pmatrix} \quad (11)$$

$$\xrightarrow{R_1 \leftarrow R_1 / 8} \begin{pmatrix} 1 & 0 & -2 \\ 5 & -1 & -10 \end{pmatrix} \quad (12)$$

$$\xrightarrow{R_2 \leftarrow R_2 - 5R_1} \begin{pmatrix} 1 & 0 & -2 \\ 0 & -1 & 0 \end{pmatrix} \quad (13)$$

$$\xrightarrow{R_2 \leftarrow -R_2} \begin{pmatrix} 1 & 0 & -2 \\ 0 & 1 & 0 \end{pmatrix} \quad (14)$$

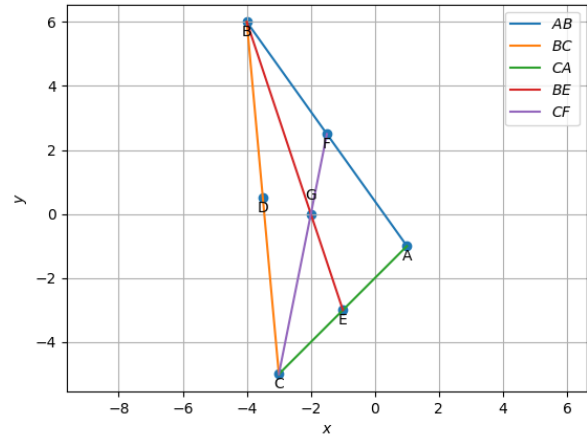


Fig. 0. G is the centroid of triangle ABC

Therefore,

$$\mathbf{G} = \begin{pmatrix} -2 \\ 0 \end{pmatrix} \quad (15)$$

From Fig. 0, We can see that $\mathbf{G} = \begin{pmatrix} -2 \\ 0 \end{pmatrix}$ is the intersection of BE and CF