Probability Assignment

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Question: Find the intersection **G** of BE and CF

Solution: **A**, **B** and **C** are vertices of triangle:

$$\mathbf{A} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} \tag{1}$$

$$\mathbf{B} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} \tag{2}$$

$$\mathbf{C} = \begin{pmatrix} -3 \\ -5 \end{pmatrix} \tag{3}$$

Since **E** and **F** are midpoints of CA and AB,

$$\mathbf{E} = \frac{\mathbf{A} + \mathbf{C}}{2} \tag{4}$$

$$= \begin{pmatrix} -1 \\ -3 \end{pmatrix} \tag{5}$$

$$\mathbf{F} = \frac{\mathbf{B} + \mathbf{A}}{2} \tag{6}$$

$$= \begin{pmatrix} \frac{-3}{2} \\ \frac{5}{2} \end{pmatrix} \tag{7}$$

The line BE in vector form is given by

$$\begin{pmatrix} 3 & 1 \end{pmatrix} \mathbf{x} = \begin{pmatrix} -6 \end{pmatrix} \tag{8}$$

The line CF in vector form is given by

$$\begin{pmatrix} 5 & -1 \end{pmatrix} \mathbf{x} = \begin{pmatrix} -10 \end{pmatrix} \tag{9}$$

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

$$\begin{pmatrix} 3 & 1 & -6 \\ 5 & -1 & -10 \end{pmatrix} \tag{10}$$

Solve for **x** using Gauss-Elimination method:

$$\begin{pmatrix} 3 & 1 & -6 \\ 5 & -1 & -10 \end{pmatrix} \xleftrightarrow{R_1 \leftarrow R_1 + R_2} \begin{pmatrix} 8 & 0 & -16 \\ 5 & -1 & -10 \end{pmatrix} \tag{11}$$

$$\xleftrightarrow{R_1 \leftarrow R_1/8} \begin{pmatrix} 1 & 0 & -2 \\ 5 & -1 & -10 \end{pmatrix} \tag{12}$$

$$\xleftrightarrow{R_2 \leftarrow R_2 - 5R_1} \begin{pmatrix} 1 & 0 & -2 \\ 0 & -1 & 0 \end{pmatrix} \tag{13}$$

$$\xleftrightarrow{R_2 \leftarrow -R_2} \begin{pmatrix} 1 & 0 & -2 \\ 0 & 1 & 0 \end{pmatrix} \tag{14}$$

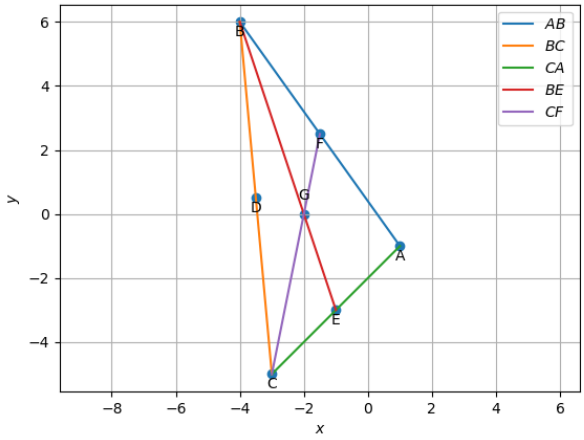

Fig. 0. G is the centroid of triangle ABC

Therefore,

$$\mathbf{G} = \begin{pmatrix} -2 \\ 0 \end{pmatrix} \tag{15}$$

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