Assignment - 1
EE23010: Probability and Random Processes
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Question 1.1.4 - The parametric form of the equation of AB is

$$\mathbf{x} = \mathbf{A} + k\mathbf{m} \quad (1)$$

where

$$\mathbf{m} = \mathbf{B} - \mathbf{A} \quad (2)$$

is the direction vector of AB. Find the parametric equations of AB,BC and CA.

Solution: Given,

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

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

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

1) Parametric form of AB:

$$\mathbf{x} = \mathbf{A} + k\mathbf{m} \quad (6)$$

where,

$$\mathbf{m} = \mathbf{B} - \mathbf{A}$$

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} - \begin{pmatrix} 1 \\ -1 \end{pmatrix} \quad (7)$$

$$= \begin{pmatrix} (-4) - 1 \\ 6 - (-1) \end{pmatrix} \quad (8)$$

$$\mathbf{m} = \begin{pmatrix} -5 \\ 7 \end{pmatrix} \quad (9)$$

therefore,

$$AB : \mathbf{x} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} + k\begin{pmatrix} -5 \\ 7 \end{pmatrix} \quad (10)$$

2) Parametric equation of line BC:

$$\mathbf{x} = \mathbf{B} + k\mathbf{m}$$

,
where

$$\mathbf{m} = \mathbf{C} - \mathbf{B}$$

$$\mathbf{C} - \mathbf{B} = \begin{pmatrix} -3 \\ -5 \end{pmatrix} - \begin{pmatrix} -4 \\ 6 \end{pmatrix} \quad (11)$$

$$= \begin{pmatrix} -3 - (-4) \\ -5 - (6) \end{pmatrix} \quad (12)$$

$$\mathbf{m} = \begin{pmatrix} 1 \\ -11 \end{pmatrix} \quad (13)$$

$$BC : \mathbf{x} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} + k\begin{pmatrix} 1 \\ -11 \end{pmatrix} \quad (14)$$

3) Parametric equation of line CA:

$$\mathbf{x} = \mathbf{C} + k\mathbf{m}$$

where

$$\mathbf{m} = \mathbf{A} - \mathbf{C}$$

$$\mathbf{A} - \mathbf{C} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} - \begin{pmatrix} -3 \\ -5 \end{pmatrix} \quad (15)$$

$$= \begin{pmatrix} 1 - (-3) \\ (-1) - (-5) \end{pmatrix} \quad (16)$$

$$\mathbf{m} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad (17)$$

$$CA : \mathbf{x} = \begin{pmatrix} -3 \\ -5 \end{pmatrix} + k\begin{pmatrix} 4 \\ 4 \end{pmatrix} \quad (18)$$