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

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

where

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

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

Solution: Given,

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

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

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

1) Parametric form of AB:

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

where,

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

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

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

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

therefore,

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

2) Parametric form of line BC:

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

where,

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

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

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

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

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

3) Parametric form of line CA:

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

where

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

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

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

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

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