Assignment - 1

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

$$\mathbf{x} = \mathbf{A} + k\mathbf{m} \tag{1}$$

where

$$\mathbf{m} = \mathbf{B} - \mathbf{A} \tag{2}$$

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

Solution: Given,

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

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

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

1) Parametric form of AB:

$$\mathbf{x} = \mathbf{A} + k\mathbf{m} \tag{6}$$

where,

$$\mathbf{m} = \mathbf{B} - \mathbf{A} \tag{7}$$

$$\mathbf{B} - \mathbf{A} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} - \begin{pmatrix} 1 \\ -1 \end{pmatrix} \tag{8}$$

$$= \begin{pmatrix} (-4) - 1 \\ 6 - (-1) \end{pmatrix} \tag{9}$$

$$\implies \mathbf{m} = \begin{pmatrix} -5 \\ 7 \end{pmatrix} \tag{10}$$

therefore,

$$\text{AB} : \mathbf{x} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} + k\begin{pmatrix} -5 \\ 7 \end{pmatrix} \tag{11}$$

2) Parametric form of line BC:

$$\mathbf{x} = \mathbf{B} + k\mathbf{m} \tag{12}$$

where,

$$\mathbf{m} = \mathbf{C} - \mathbf{B} \tag{13}$$

$$\mathbf{C} - \mathbf{B} = \begin{pmatrix} -3 \\ -5 \end{pmatrix} - \begin{pmatrix} -4 \\ 6 \end{pmatrix} \tag{14}$$

$$= \begin{pmatrix} -3 - (-4) \\ -5 - (6) \end{pmatrix} \tag{15}$$

$$\implies \mathbf{m} = \begin{pmatrix} 1 \\ -11 \end{pmatrix} \tag{16}$$

$$\text{BC} : \mathbf{x} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} + k\begin{pmatrix} 1 \\ -11 \end{pmatrix} \tag{17}$$

3) Parametric form of line CA:

$$\mathbf{x} = \mathbf{C} + k\mathbf{m} \tag{18}$$

where,

$$\mathbf{m} = \mathbf{A} - \mathbf{C} \tag{19}$$

$$\mathbf{A} - \mathbf{C} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} - \begin{pmatrix} -3 \\ -5 \end{pmatrix} \tag{20}$$

$$= \begin{pmatrix} 1 - (-3) \\ (-1) - (-5) \end{pmatrix} \tag{21}$$

$$\implies \mathbf{m} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \tag{22}$$

$$\text{CA} : \mathbf{x} = \begin{pmatrix} -3 \\ -5 \end{pmatrix} + k\begin{pmatrix} 4 \\ 4 \end{pmatrix} \tag{23}$$