

Assignment 1

Probability And Random Processes

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Question 1.2.1:

Problem Statement

Given,

$$\mathbf{A} = \begin{pmatrix} 1 \\ -1 \end{pmatrix} \quad \mathbf{B} = \begin{pmatrix} -4 \\ 6 \end{pmatrix} \quad \mathbf{C} = \begin{pmatrix} -3 \\ -5 \end{pmatrix}$$

find mid points **D, E, F** of the sides BC, CA, AB respectively

solution

The midpoint of a side divides it in a 1:1 ratio. Therefore as given in the question, If

And,

$$\mathbf{D} = \frac{k\mathbf{C} + \mathbf{B}}{k + 1}$$

as **D** is a midpoint k:1

$$\begin{aligned} \mathbf{D} &= \frac{\mathbf{C} + \mathbf{B}}{2} \\ &= \frac{\begin{pmatrix} -3 \\ -5 \end{pmatrix} + \begin{pmatrix} -4 \\ 6 \end{pmatrix}}{2} \\ &= \frac{\begin{pmatrix} -7 \\ 1 \end{pmatrix}}{2} \\ \mathbf{D} &= \begin{pmatrix} -3.5 \\ 0.5 \end{pmatrix} \end{aligned}$$

$$\begin{aligned} \mathbf{E} &= \frac{\mathbf{B} + \mathbf{A}}{2} \\ &= \frac{\begin{pmatrix} -4 \\ 6 \end{pmatrix} + \begin{pmatrix} 1 \\ -1 \end{pmatrix}}{2} \\ &= \frac{\begin{pmatrix} -3 \\ 5 \end{pmatrix}}{2} \\ \mathbf{E} &= \begin{pmatrix} -1.5 \\ 2.5 \end{pmatrix} \end{aligned}$$

$$\begin{aligned} \mathbf{F} &= \frac{\mathbf{A} + \mathbf{C}}{2} \\ &= \frac{\begin{pmatrix} 1 \\ -1 \end{pmatrix} + \begin{pmatrix} -3 \\ -5 \end{pmatrix}}{2} \\ &= \frac{\begin{pmatrix} -2 \\ -6 \end{pmatrix}}{2} \\ \mathbf{F} &= \begin{pmatrix} -1 \\ -3 \end{pmatrix} \end{aligned}$$

Therefore the midpoints are,

$$\mathbf{D} = \begin{pmatrix} -3.5 \\ 0.5 \end{pmatrix} \quad \mathbf{E} = \begin{pmatrix} -1.5 \\ 2.5 \end{pmatrix} \quad \mathbf{F} = \begin{pmatrix} -1 \\ -3 \end{pmatrix}$$

Similarly,