Assignment 1

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Solution for Problem 1.1.1

Problem Statement

Given triangle with vertices

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

The direction vector of AB is defined as

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

Find the direction vectors of AB, BC and CA.

Solution

Given

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

$$\begin{aligned} \text{The direction vector of } AB &= \mathbf{B} - \mathbf{A} && (4)\\ &= \begin{pmatrix} -4 \\ 6 \end{pmatrix} - \begin{pmatrix} 1 \\ -1 \end{pmatrix} && (5)\\ &= \begin{pmatrix} -5 \\ 7 \end{pmatrix} && (6) \end{aligned}$$

$$\begin{aligned} \text{The direction vector of } BC &= \mathbf{C} - \mathbf{B} && (7)\\ &= \begin{pmatrix} -3 \\ 5 \end{pmatrix} - \begin{pmatrix} -4 \\ 6 \end{pmatrix} && (8)\\ &= \begin{pmatrix} 1 \\ -11 \end{pmatrix} && (9) \end{aligned}$$

$$\begin{aligned} \text{The direction vector of } CA &= \mathbf{A} - \mathbf{C} && (10)\\ &= \begin{pmatrix} 1 \\ -1 \end{pmatrix} - \begin{pmatrix} -3 \\ -5 \end{pmatrix} && (11)\\ &= \begin{pmatrix} 4 \\ 4 \end{pmatrix} && (12) \end{aligned}$$