Assignment1

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Abstract— **This document explains the concept of collinear and whether the triangle formed by given 3 points is right angled triangle or not.**

I. PROBLEM

Without using the Pythagoras theorem, show that $\begin{pmatrix} 4 \\ 4 \end{pmatrix}$, $\begin{pmatrix} 3 \\ 5 \end{pmatrix}$ and $\begin{pmatrix} -1 \\ -1 \end{pmatrix}$ are the vertices of a right angled triangle?

II. SOLUTION

The direction vectors of A-B, A-C and B-C are

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

$$A - C = \begin{pmatrix} -5 \\ -5 \end{pmatrix} \tag{2}$$

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

1) A-B . B-C =

$$\begin{pmatrix} -1 & 1 \end{pmatrix} . \begin{pmatrix} -4 \\ -6 \end{pmatrix} = -2 \tag{4}$$

A-B . B-C = -2 $\neq$ 0 Sides AB and BC of triangle are not perpendicular.

2) A-C . B-C =

$$\begin{pmatrix} -5 & -5 \end{pmatrix} . \begin{pmatrix} -4 \\ -6 \end{pmatrix} = 50 \tag{5}$$

A-C . B-C = 50 $\neq$ 0 Sides AC and BC of triangle are not perpendicular.

3) A-B . A-C =

$$\begin{pmatrix} -1 & 1 \end{pmatrix} . \begin{pmatrix} -5 \\ -5 \end{pmatrix} = 0 \tag{6}$$

A-B . A-C = 0 Sides AB and AC of triangle are perpendicular to each other and the right angle at vertex $\begin{pmatrix} 4 \\ 4 \end{pmatrix}$, and the following figure represents the triangle formed by given points A, B and C.

Right Angle Triangle