Assignment on line

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I. Question

Class 11, Exercise 10.1, Q(6): **Without using the pythagoras theorem ,show that the points (4,4),(3,5) and (-1,-1) are the vertices of a right angled triangle.**

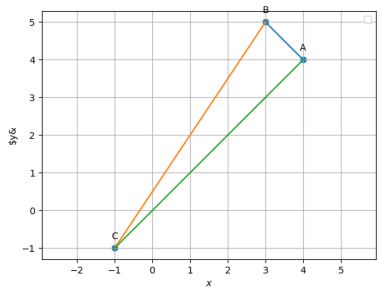

Figure 1: Traingle ABC

II. Solution

Let A,B and C be the vertices of a given traingle with coordinates $\begin{pmatrix}4\\4\end{pmatrix}$, $\begin{pmatrix}3\\5\end{pmatrix}$ and $\begin{pmatrix}-1\\-1\end{pmatrix}$. we have verify whther the given vertices are of right angled triangle or not.

Let The directional vector of two vectors A and B is given as AB (m1)=A-B.

The directional vector of the vectors B and C is given as BC (m2)=B-C.

The directinal vector of the vectors C and A is given as CA (m3)=C-A.

The angle between any two vectors is given by 0.2cm

$$\boldsymbol{cosb = \frac{(m1)^T(m2)}{||m1||||m2||}equation - 1}$$

Where b is the angle between the two vectors . when the angle b=90 ,we get cos 90=0.

It implies that the numerator of the equation 1 should be zero.

In order to prove that the triangle is right angled we have to show any two vectors should be orthogonal to each other.

So we need to show $(A-B)^T(B-C) or (B-C)^T(C-A) or (C-A)^T(A-B)$ is equal to zero.

C-A=$\begin{pmatrix}-1\\-1\end{pmatrix} - \begin{pmatrix}4\\4\end{pmatrix} = \begin{pmatrix}-5\\-5\end{pmatrix}$

$(C-A)^T = (-5-5)$, A-B=$\begin{pmatrix}4\\4\end{pmatrix} - \begin{pmatrix}3\\5\end{pmatrix} = \begin{pmatrix}1\\-1\end{pmatrix}$

$$(C-A)^T(A-B) = (-5-5)\begin{pmatrix}1\\-1\end{pmatrix} = -5+5 = 0$$

From above we can say that directional vectors

CA and AB are perpendicular to each other.

Thus we have right angle at the vertex A.

Construction

Symbol	Value	Description
A	(4,4)	Vertex A
B	(3,5)	Vertex B
C	(-1,-1)	Vertex C

Get the python code of the figures from

https://github.com/SinkonaChinthamalla/fwc/blob/main/matrix/line/codes