

Assignment 1

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Download all latex-tikz codes from

<https://github.com/Kkuntal990/C-DS/blob/main/Assignment2/assignment2.tex>

$$|\vec{AB}| = 5.744 \quad (2.3.1)$$

$$|\vec{AC}| = 11.489 \quad (2.3.2)$$

$$|\vec{BC}| = 5.744 \quad (2.3.3)$$

1 PROBLEM

Show that the points $\mathbf{A} = \begin{pmatrix} 1 \\ 2 \\ 7 \end{pmatrix}$, $\mathbf{B} = \begin{pmatrix} 2 \\ 6 \\ 3 \end{pmatrix}$ and $\mathbf{C} = \begin{pmatrix} 3 \\ 10 \\ -1 \end{pmatrix}$

are collinear.

Therefore, the points are collinear.

2 SOLUTION

We will solve for a general case of given \mathbf{n} points of \mathbf{m} dimensions. Check whether three points

$$A = \begin{pmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{pmatrix}, B = \begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{pmatrix}, C = \begin{pmatrix} z_1 \\ z_2 \\ \vdots \\ z_n \end{pmatrix}$$

are collinear or not.

2.4 Proof by plot

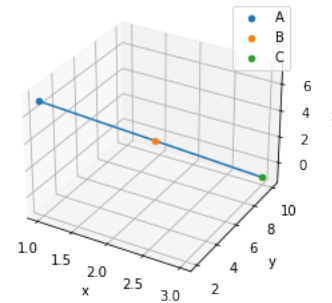


Fig. 0: Plotting the 3 points

2.1 Necessary condition

Let's take three points \mathbf{a} , \mathbf{b} and \mathbf{c} . We will say that these points are collinear if and only if the $\max|\vec{AB}|, |\vec{AC}|, |\vec{BC}| = \text{sum of other two distances}$. That is, let's say \vec{AB} is the maximum of three,

$$\Rightarrow \vec{AB} = \vec{AC} + \vec{BC}$$

2.2 Proof:

Without loss of generality we can take the above example. Let's say that $\Rightarrow \vec{AB} < \vec{AC} + \vec{BC}$, then due to triangle inequality we can say that the points \mathbf{a} , \mathbf{b} and \mathbf{c} form a triangle.

2.3 Example

Taking our above problem. $\mathbf{A} = \begin{pmatrix} 1 \\ 2 \\ 7 \end{pmatrix}$, $\mathbf{B} = \begin{pmatrix} 2 \\ 6 \\ 3 \end{pmatrix}$ and

$$\mathbf{C} = \begin{pmatrix} 3 \\ 10 \\ -1 \end{pmatrix}$$