ASSIGNMENT 1

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Download latex-tikz code from

https://github.com/ArunSiddardha/EE3900/tree/main/Assignment_1/Assignment_1.tex

Download python code from

https://github.com/ArunSiddardha/EE3900/tree/main/Assignment_1/code/Assignment_1.py

1 PROBLEM

If the vertices of an isoceles triangle are given by $\mathbf{B} = \begin{pmatrix} -2 \\ -2 \end{pmatrix}$, $\mathbf{A} = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$ and $\mathbf{C} = \begin{pmatrix} 3 \\ 1 \end{pmatrix}$ .Find the distance of the vertex A from the base of the triangle

SOLUTION

Since, Given that triangle is iscoceles let us check which two sides are equal,

$$\begin{aligned} BC = a = \|\mathbf{B} - \mathbf{C}\| &= \sqrt{(-2-3)^2 + (-2-1)^2} \\ &= \sqrt{25+9} \\ &= \sqrt{31} \\ AB = c = \|\mathbf{A} - \mathbf{B}\| &= \sqrt{(-1+2)^2 + (2-(-2))^2} \\ &= \sqrt{1+16} \\ &= \sqrt{17} \\ CA = b = \|\mathbf{C} - \mathbf{A}\| &= \sqrt{(3+1)^2 + (1-2)^2} \\ &= \sqrt{16+1} \\ &= \sqrt{17} \end{aligned}$$

So, we can see that sides AB , AC are same.
So, the distance between A and the side BC is same as distance between the vertex A and mid point D the side BC.

Mid point of BC is

$$\mathbf{D} = \frac{\mathbf{B}+\mathbf{C}}{2} = \begin{pmatrix} \frac{3-2}{2} \\ \frac{1-2}{2} \end{pmatrix} = \begin{pmatrix} \frac{-1}{2} \\ \frac{-1}{2} \end{pmatrix}$$

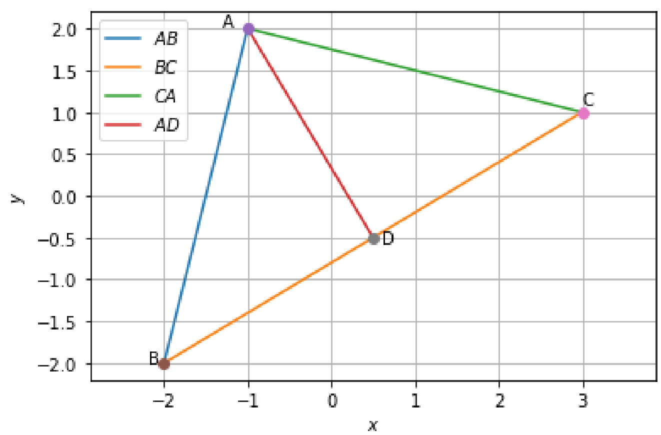

Fig. 0: plot

$$\begin{aligned} AD = \|\mathbf{A} - \mathbf{D}\| &= \sqrt{(-1-\frac{1}{2})^2 + (2-\frac{-1}{2})^2} \\ &= \sqrt{\frac{9}{4} + \frac{25}{4}} \\ &= \sqrt{\frac{34}{4}} \\ &= \frac{\sqrt{34}}{2} \end{aligned}$$

Therefore the distance is $\frac{\sqrt{34}}{2}$