Assignment No.2

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1 QUESTION No.2.25

Find a point on the y-axis which is equidistant from the points A=$\begin{pmatrix}6\\5\end{pmatrix}$ and B=$\begin{pmatrix}-4\\3\end{pmatrix}$

2 SOLUTION

Given,

$$\mathbf{A} = \begin{pmatrix}6\\5\end{pmatrix} \tag{2.0.1}$$

$$\mathbf{B} = \begin{pmatrix}-4\\3\end{pmatrix} \tag{2.0.2}$$

Let x be the point on y-axis.Then

$$\boxed{\|\mathbf{x} - \mathbf{A}\|^2 = \|\mathbf{x} - \mathbf{B}\|^2}$$

From given information

$$\|\mathbf{x} - \mathbf{A}\|^2 = \|x\|^2 + \left\|\begin{pmatrix}6\\5\end{pmatrix}\right\|^2 - 2(6\ 5)x$$

$$\|\mathbf{x} - \mathbf{B}\|^2 = \|x\|^2 + \left\|\begin{pmatrix}-4\\3\end{pmatrix}\right\|^2 - 2(-4\ 3)x$$

$$\implies \|x\|^2 + \left\|\begin{pmatrix}6\\5\end{pmatrix}\right\|^2 - 2(6\ 5)x = \|x\|^2 + \left\|\begin{pmatrix}-4\\3\end{pmatrix}\right\|^2 - 2(-4\ 3)x$$

$$\implies 2(6\ 5)x - 2(-4\ 3)x = \left\|\begin{pmatrix}6\\5\end{pmatrix}\right\|^2 + \left\|\begin{pmatrix}-4\\3\end{pmatrix}\right\|^2$$

$$\implies (20\ 4)x = 61 - 25$$

$$\implies (20\ 4) \times \begin{pmatrix}0\\y\end{pmatrix} = 36$$

$$\implies 4y = 36$$

$$\implies \boxed{y = 9}$$

Finally the desired point on y-axis equidistance from A and B is $\begin{pmatrix}0\\9\end{pmatrix}$.
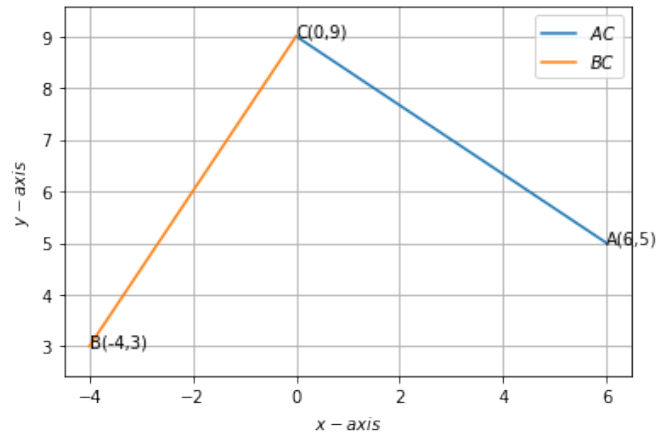
See the figure generated by using python

Fig. 2.1: Fig. 2.25