Assignment No.2

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Download all python codes from

https://github.com/Vallidevibolla/Assignment−2−1/blob/main/code.py

and latex-tikz codes from

https://github.com/Vallidevibolla/Assignment−2−1/blob/main/main.tex

Question taken from

https://github.com/gadepall/ncert/blob/main/linalg/vectors/gvv_ncert_vectors.pdf− Q.no.2.25

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

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

$$\implies \|\mathbf{x}-\mathbf{A}\|^2 = \|x\|^2+\|A\|^2 - 2\mathbf{A}^T x$$

From given information

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

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

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

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

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

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

$$\implies \mathbf{4y} = 36$$

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

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

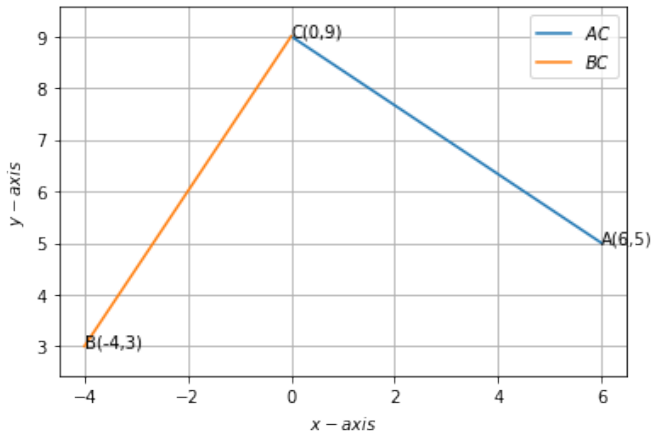

Fig. 2.1: Fig. 2.25