1.1.9.20

EE24BTECH11058 - P.Shiny Diavajna

Question:

Find a point on the Y axis which is equidistant from the points $\begin{pmatrix} 5 \\ -2 \end{pmatrix}$ and $\begin{pmatrix} -3 \\ 2 \end{pmatrix}$.

Solution:

Symbol	Value	Description
A	$\begin{pmatrix} 5 \\ -2 \end{pmatrix}$	First point
B	$\begin{pmatrix} -3 \\ 2 \end{pmatrix}$	Second point
Y	$\begin{pmatrix} 0 \\ y \end{pmatrix}$	Point on Y-Axis equidistant from A and B

TABLE 0: Variables Used

$$\|\mathbf{A} - \mathbf{Y}\|^2 = \|\mathbf{B} - \mathbf{Y}\|^2 \tag{0.1}$$

$$(\mathbf{A} - \mathbf{Y})^\top (\mathbf{A} - \mathbf{Y}) = (\mathbf{B} - \mathbf{Y})^\top (\mathbf{B} - \mathbf{Y}) \tag{0.2}$$

$$\mathbf{A}^\top \mathbf{A} - \mathbf{B}^\top \mathbf{B} = 2\left(\mathbf{A}^\top - \mathbf{B}^\top\right)(\mathbf{Y}) \tag{0.3}$$

$$16 = 2\left(\begin{pmatrix} 8 & -4 \end{pmatrix}\right)\begin{pmatrix} 0 \\ y \end{pmatrix} \tag{0.4}$$

$$y = -2 \tag{0.5}$$

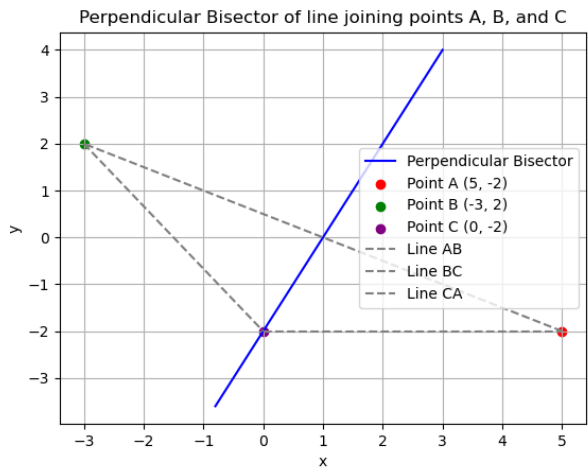The point on the Y axis which is equidistant to **A** and **B** is $\begin{pmatrix} 0 \\ -2 \end{pmatrix}$

Fig. 0.1: Plot of the given points and the bisector