1.1.8.26

EE24BTECH11047 - Niketh Prakash Achanta

Question:
Find a point on the Y axis which is equidistant from the points $\mathbf{A}\left(6,5\right)$ $\mathbf{B}\left(-4,3\right)$.

Solution:

Variable	Description	Formula
A	A Point to be plotted	$A = \begin{pmatrix}6\\5\end{pmatrix}$
B	A Point to be plotted	$B = \begin{pmatrix}-4\\3\end{pmatrix}$

TABLE 0

If $\mathbf{P}$ is equidistant from the points $\mathbf{A}$ and $\mathbf{B}$

$$\|\mathbf{P}-\mathbf{A}\| = \|\mathbf{P}-\mathbf{B}\| \tag{0.1}$$

$$\|\mathbf{P}-\mathbf{A}\|^2 = \|\mathbf{P}-\mathbf{B}\|^2 \tag{0.2}$$

$$\|\mathbf{P}\|^2 - 2\mathbf{P}^\top\mathbf{A} + \|\mathbf{A}\|^2 = \|\mathbf{P}\|^2 - 2\mathbf{P}^\top\mathbf{B} + \|\mathbf{B}\|^2 \tag{0.3}$$

By simplifying further,

$$\left(\mathbf{A}-\mathbf{B}\right)^\top\mathbf{P} = \frac{\|\mathbf{A}\|^2 - \|\mathbf{B}\|^2}{2} \tag{0.4}$$

$$\begin{pmatrix}10\\2\end{pmatrix}^\top\mathbf{P} = \frac{\left\|\begin{pmatrix}6\\5\end{pmatrix}\right\|^2 - \left\|\begin{pmatrix}-4\\3\end{pmatrix}\right\|^2}{2} = 18 \tag{0.5}$$

Comparing with $n^\top x = c$

$$\mathbf{n} = \begin{pmatrix}10\\2\end{pmatrix} \tag{0.6}$$

$$\mathbf{c} = 18 \tag{0.7}$$

$$10x + 2y = 18 \tag{0.8}$$

$$x = 0, y = 9 \tag{0.9}$$

$$\mathbf{P} = \begin{pmatrix}0\\9\end{pmatrix} \tag{0.10}$$

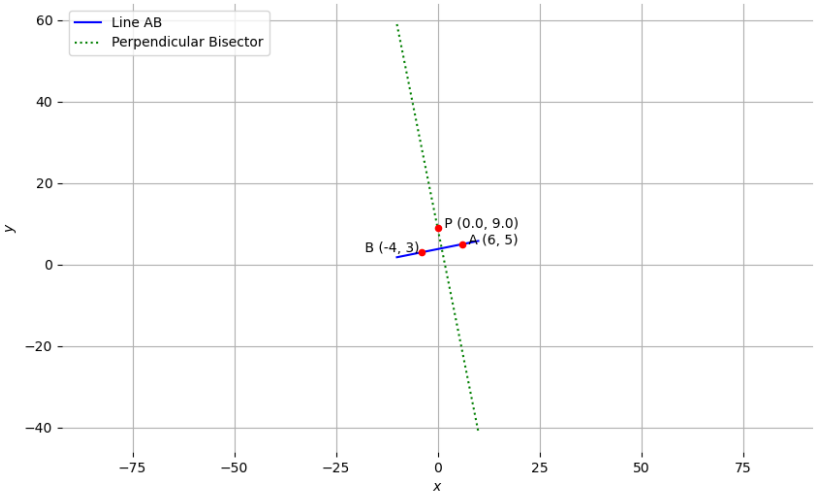
Line AB
Perpendicular Bisector
P (0.0, 9.0)
A (6, 5)
B (-4, 3)
60
40
20
0
−20
−40
−75
−50
−25
0
25
50
75
y
x

Fig. 0.1