EE2802: Assignment3

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1 Problem

Find the point on $x-axis$ that is equidistant from points $\begin{pmatrix}7\\6\end{pmatrix}$ and $\begin{pmatrix}3\\4\end{pmatrix}$

2 Solution

The given point (say $\mathbf{P}$) is equidistant from

$$\mathbf{A} = \begin{pmatrix}7\\6\end{pmatrix} \tag{2.0.1}$$

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

$$\implies \|\mathbf{A}-\mathbf{P}\|^2 = \|\mathbf{B}-\mathbf{P}\|^2 \tag{2.0.3}$$

$$\|\mathbf{A}\|^2 - 2\mathbf{A}^\top\mathbf{P} + \|\mathbf{P}\|^2 = \|\mathbf{B}\|^2 - 2\mathbf{B}^\top\mathbf{P} + \|\mathbf{P}\|^2 \tag{2.0.4}$$

$$(2\mathbf{B}^\top - 2\mathbf{A}^\top)\,\mathbf{P} = \|\mathbf{B}\|^2 - \|\mathbf{A}\|^2 \tag{2.0.5}$$

$$\begin{pmatrix}2 & 1\end{pmatrix}\mathbf{P} = 15 \tag{2.0.6}$$

Also, P lies on $x-axis$

$$\implies \begin{pmatrix}0 & 1\end{pmatrix}\mathbf{P} = 0 \tag{2.0.7}$$

$$\begin{pmatrix}2 & 1\\ 0 & 1\end{pmatrix}\mathbf{P} = \begin{pmatrix}15\\0\end{pmatrix} \tag{2.0.8}$$

$$\tag{2.0.9}$$

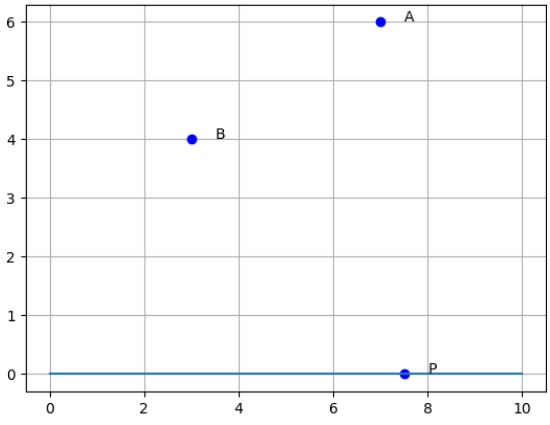

Fig. 0: Figure1

Augmented matrix,

$$\begin{pmatrix}2 & 1 & 15\\ 0 & 1 & 0\end{pmatrix} \tag{2.0.10}$$

$$\xleftrightarrow{R_1 \leftarrow \frac{1}{2}(R_1 - R_2)} \tag{2.0.11}$$

$$\begin{pmatrix}1 & 0 & \frac{15}{2}\\ 0 & 1 & 0\end{pmatrix} \tag{2.0.12}$$

$$\therefore,\ \mathbf{P} = \begin{pmatrix}\frac{15}{2}\\0\end{pmatrix} \tag{2.0.13}$$