Assignment 1

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Download all python codes from

https://github.com/Bharat437/Matrix_Theory/tree/master/Assignment1/Codes

and latex-tikz codes from

https://github.com/Bharat437/Matrix_Theory/tree/master/Assignment1

1 Question No. 41

Find the equation of the right bisector of the line segment joining the points $\begin{pmatrix}3\\4\end{pmatrix}$ and $\begin{pmatrix}-1\\2\end{pmatrix}$

2 Explanation

The right bisector of the line segment joining two points passes through mid-point between two points and it is perpendicular to the line segment.

Let $\mathbf{M}$ be the midpoint of two points $\mathbf{A}=\begin{pmatrix}3\\4\end{pmatrix}$ and $\mathbf{B}=\begin{pmatrix}-1\\2\end{pmatrix}$.

$$\mathbf{M} = \frac{\mathbf{A}+\mathbf{B}}{2} = \frac{1}{2}\begin{pmatrix}2\\6\end{pmatrix} \tag{2.0.1}$$

$$\implies \mathbf{M} = \begin{pmatrix}1\\3\end{pmatrix}$$

Using section 3.1.22, Let $\mathbf{x}$ be an equidistant point from points $\mathbf{A}$ and $\mathbf{B}$. Then we have

$$\left\|\mathbf{x}-\begin{pmatrix}3\\4\end{pmatrix}\right\|^2 = \left\|\mathbf{x}-\begin{pmatrix}-1\\2\end{pmatrix}\right\|^2 \tag{2.0.2}$$

$$\implies \|\mathbf{x}\|^2 + \left\|\begin{pmatrix}3\\4\end{pmatrix}\right\|^2 - 2\begin{pmatrix}3 & 4\end{pmatrix}\mathbf{x}$$

$$= \|\mathbf{x}\|^2 + \left\|\begin{pmatrix}-1\\2\end{pmatrix}\right\|^2 - 2\begin{pmatrix}-1 & 2\end{pmatrix}\mathbf{x} \tag{2.0.3}$$

$$\begin{pmatrix}2 & 1\end{pmatrix}\mathbf{x} = 5 \tag{2.0.4}$$

We got equation of the right bisector of line segment joining points $\mathbf{A}$ and $\mathbf{B}$. The line also passes through point $\mathbf{M}$

Plot of Line segment and Right bisector: