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

$$\mathbf{M} = \frac{\mathbf{A} + \mathbf{B}}{2} = \frac{1}{2} \begin{pmatrix} 2 \\ 6 \end{pmatrix}$$
 (2.0.1)
$$\implies \mathbf{M} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}$$

The direction vector of line AB is

$$\binom{-1}{2} - \binom{3}{4} = \binom{-4}{-2}$$
 (2.0.2)

The direction vector of line AB is normal vector of right bisector. Then

$$\mathbf{n} = \begin{pmatrix} -4 \\ -2 \end{pmatrix} \tag{2.0.3}$$

The equation of line in terms of normal vector is then obtained as

$$\mathbf{n}^T(\mathbf{x} - \mathbf{M}) = 0 \tag{2.0.4}$$

$$\implies \left(-4 -2 \right) \left(\mathbf{x} - \begin{pmatrix} 1 \\ 3 \end{pmatrix} \right) = 0 \tag{2.0.5}$$

$$\implies \left(\begin{array}{cc} -4 & -2 \end{array} \right) \mathbf{x} = -10 \tag{2.0.6}$$

$$\implies (2 1)\mathbf{x} = 5 \qquad (2.0.7)$$

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

See Fig. 1 for plot of line segment and right bisector.

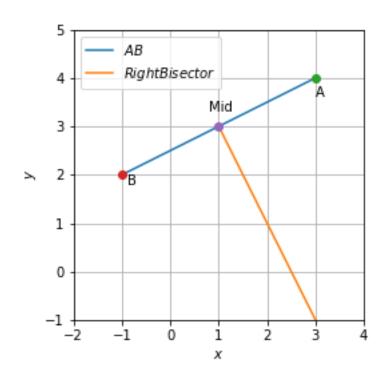


Fig. 1: Right bisector of line AB