

Matrix Theory EE5609

Assignment-1

Prasanth Kumar Duba
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- 1 Problem 53: Find the direction in which a straight line must be drawn through the point $(-\frac{1}{2})$ so that its point of intersection with the line**

$$(1 - 1)x = 4$$

may be the distance of 3 units from this point.

Solution:

Let the slope of the line m , which is passing through the point $A(-1,2)$.

So, the equation of the line is :

$$y = mx + m + 2 \implies (m - 1)x = -m - 2 \quad (1)$$

Also the given equation of the line is:

$$y = 4 - x \implies (1 - 1)x = 4 \quad (2)$$

Consider these two lines meet at a point B .

From (1) and (2),

$$B = \left(\frac{m+6}{m+1}, \frac{3m-2}{m+1}\right)$$

Now, Given that $AB = 3$

$$\implies AB^2 = 9 \implies \left(\frac{m+6}{m+1} + 1\right)^2 + \left(\frac{3m-2}{m+1} - 2\right)^2 = 9$$

$$\implies 2m^2 - m - 28 = 0$$

$$\Rightarrow m = 4, m = -3.5$$

$$\Rightarrow \tan\theta = 4 \text{ or } \tan\theta = -3.5$$

Hence, the direction angle $\theta = 75.96^\circ$ or $\theta = -74.05^\circ$

Now, consider $m = 4$ and the equations are :

$$4x - y + 6 = 0$$

$$x + y - 4 = 0$$

The plot is as follows:

