

Assignment 1

Pulkit Saxena

1 QUESTION No. 42

Find the equation of lines through the point $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ which make an angle of 45° to the line

$$(1 \ -2)\mathbf{x} = 3. \quad (1.0.1)$$

2 ASSUMPTIONS

Let m_1 be the slope of the line passing through point(3,2) and making an angle of 45° with the given Line equation.

Let m_2 is the slope of the given line equation

3 SOLUTION

The Angle between 2 Lines is given by the formulae :

$$\tan \theta = \left| \frac{m_2 - m_1}{1 + m_1 m_2} \right| \quad (3.0.1)$$

On Substituting $\theta=45^\circ$ and $\tan \theta = 1$ we have the following 2 cases

3.1 Case 1

Modulus is opened with positive sign

$$\frac{.5 - m_1}{1 + .5 \cdot m_1} = 1 \quad (3.1.1)$$

Solving this equation we get $m_1 = - .33$ So the Equation of the line passing through point(3,2) with slope $m_1 = - .33$ is given as

$$x + 3 \cdot y = 9 \quad (3.1.2)$$

3.2 Case 2

Modulus is opened with negative sign

$$- \frac{.5 - m_1}{1 + .5 \cdot m_1} = 1 \quad (3.2.1)$$

Solving this equation we get $m_1 = 3$ So the Equation of the line passing through point(3,2) with slope $m_1 = 3$ is given as

$$3 \cdot x - y = 7 \quad (3.2.2)$$

Plot of the two lines:

