# ASSIGNMENT 04

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- **Questions:**

- *Exercise:2.20:*

  Find the value of p so that the three lines

$$\begin{pmatrix} 3 & 1 \end{pmatrix} x = 2$$

$$\begin{pmatrix} p & 2 \end{pmatrix} x = 3$$

and

$$\begin{pmatrix} 2 & -1 \end{pmatrix} x = 3$$

may intersect at one point.

- **Solution:**

  Given,
  three lines

$$\begin{pmatrix} 3 & 1 \end{pmatrix} x = 2$$

$$\begin{pmatrix} p & 2 \end{pmatrix} x = 3$$

and

$$\begin{pmatrix} 2 & -1 \end{pmatrix} x = 3$$

Now,

$$\text{Augmented matrix} = \begin{pmatrix} 3 & 1 & : 2 \\ p & 2 & : 3 \\ 2 & -1 & : 3 \end{pmatrix}$$

For the three lines to intersect at a unique point, determinent shouldn't be equal to 0.

$$\therefore \qquad \begin{vmatrix} 3 & 1 & :2 \\ p & 2 & :3 \\ 2 & -1 & :3 \end{vmatrix} \neq 0$$

$$3(6+3) - 1(3p-6) + 2(-p-4) \neq 0$$

$$27 - 3p + 6 - 2p - 8 \neq 0$$

$$25 - 5p \neq 0$$

$$p \neq 5$$

*Exercise:2.22:*

If the lines

$$\begin{pmatrix} -3 & 1 \end{pmatrix} x = 1$$
$$\begin{pmatrix} -1 & 2 \end{pmatrix} x = 3$$

are equally inclined to the line

$$\begin{pmatrix} -m & 1 \end{pmatrix} x = 4$$

find the value of m.

**Solution:**

Given lines,

$$l_1 : \begin{pmatrix} -3 & 1 \end{pmatrix} x = 1$$
$$l_2 : \begin{pmatrix} -1 & 2 \end{pmatrix} x = 3$$

are equally inclined to a line,

$$l_3 : \begin{pmatrix} -m & 1 \end{pmatrix} x = 4$$

Now,

$$n_3 = \begin{pmatrix} -m \\ 1 \end{pmatrix}$$

or,

$$m_3 = \begin{pmatrix} -1 \\ -m \end{pmatrix}$$

$\therefore$ slope=m

$$n_2 = \begin{pmatrix} -1 \\ 2 \end{pmatrix}$$

or,

$$m_2 = \begin{pmatrix} -2 \\ -1 \end{pmatrix}$$

$\therefore$ slope=1/2

$$n_1 = \begin{pmatrix} -3 \\ 1 \end{pmatrix}$$

or,

$$m_1 = \begin{pmatrix} -1 \\ -3 \end{pmatrix}$$

$\therefore$ slope=3

Let, $m = tan\theta$ and 'a' is inclination of lines from the given line. then,

$\theta + a = tan^{-1}3$ and $\theta - a = tan^{-1}1/2$

$$2\theta = tan^{-1}3 + tan^{-1}1/2$$

$$\theta = (71.56 + 26.56)/2$$

$\therefore$ $$\theta = 49.06$$

$$\text{m=tan}\theta$$

$$\text{m=tan(49.06)}$$

$\therefore$ $$m = 1.15$$