NOTES

MODULE 10

Parallel and Perpendicular Lines

RECALL:

- Given the general equation $Ax + By + C = 0$, the slope is given as

$$\boldsymbol{m = -\frac{A}{B} = -\frac{Coefficient\ of\ x}{Coefficient\ of\ y}}$$

- Two lines with slopes m_1 and m_2 are:
  Parallel if a) $\boldsymbol{m_1 = m_2}$ or b) **both $\boldsymbol{m_1}$ and $\boldsymbol{m_2}$ don't exist**

  Perpendicular if $\boldsymbol{m_1\, m_2 = -1}$ or $\boldsymbol{m_1 = -\frac{1}{m_2}}$

INFERENCE:

1. The lines $\boldsymbol{Ax + By + C = 0}$ and $\boldsymbol{Ax + By + K = 0}$ represent parallel lines,

   as $m_1 = -\frac{A}{B}$ and $m_2 = -\frac{A}{B}$ $\rightarrow$ $m_1 = m_2$

2. The lines $\boldsymbol{Ax + By + C = 0}$ and $\boldsymbol{Bx - Ay + K = 0}$ represent perpendicular lines,

   as $m_1 = -\frac{A}{B}$ and $m_2 = \frac{B}{A}$ $\rightarrow$ $m_1 m_2 = -1$

PROBLEMS

1. Check whether the following lines are parallel or perpendicular or none.

a) $3x + 3y - 4 = 0$ and $6x + 6y - 5 = 0$

b) $x = 5$ and $y = 6$

c) $2x - y = 0$ and $-x + y - 5 = 0$

Solution:

a) $m_1 = -\frac{3}{3} = -1$ and $m_2 = -\frac{6}{6} = -1$. Hence the lines are parallel

b) $x = 5$ is parallel to the y-axis and $y = 6$ is parallel to the x-axis, hence the lines are perpendicular.

c) $m_1 = \frac{2}{1} = 2$ and $m_2 = \frac{1}{1} = 1$. Hence the lines are neither parallel or perpendicular.

2. Find a line:

a) Parallel to $x - y + 2 = 0$

b) Perpendicular to $2x - 4y = 0$

Solution:

a) $x - y + 3 = 0$

b) $4x + 2y = 0$