1. Line Parallel to Coordinate Axes

Parallel to x-axis

- Equation: **y = b**
- Slope = 0

Parallel to y-axis

- Equation: **x = a**
- Slope is undefined

2. Slope of a Line

$$m = \tan\theta$$

where θ = angle made by the line with positive x-axis.
For two points $(x_1, y_1)$and (x_2, y_2), $m = \frac{y_2 - y_1}{x_2 - x_1}$

3. Forms of Equation of a Straight Line

(A) Slope-Intercept Form

$$y = mx + c$$

Where:

- m= slope
- c= y-intercept

Key Results

- If $c = 0$: line passes through origin.
- If $m = 0$: line is parallel to x-axis.

(B) Point-Slope Form

Line passing through $(x_1, y_1)$with slope m:

$$y - y_1 = m(x - x_1)$$

(C) Two-Point Form

Line through $(x_1, y_1)$and (x_2, y_2):

$$y - y_1 = \frac{y_2 - y_1}{x_2 - x_1}(x - x_1)$$

(D) Intercept Form

If x-intercept = $a$and y-intercept = b,

$$\frac{x}{a} + \frac{y}{b} = 1$$

Intercepts

- x-intercept = a
- y-intercept = b

(E) Normal (Perpendicular) Form

$$x\cos\alpha + y\sin\alpha = p$$

Where:

- p= perpendicular distance from origin
- α= angle made by perpendicular with positive x-axis

4. General Equation of a Straight Line

$$Ax + By + C = 0$$

Represents a straight line if **A and B are not both zero simultaneously**.

5. Conversion of General Equation

For

$$Ax + By + C = 0$$

Slope-Intercept Form

$$y = -\frac{A}{B}x - \frac{C}{B}$$

Slope

$$m = -\frac{A}{B}$$

x-intercept

$$-\frac{C}{A}$$

y-intercept

$$-\frac{C}{B}$$

6. Distance of a Point from a Line

Point:

$$(x_1, y_1)$$

Line:

$$Ax + By + C = 0$$

Distance:

$$d = \frac{| Ax_1 + By_1 + C |}{\sqrt{A^2 + B^2}}$$

7. Distance of Origin from a Line

For line

$$Ax + By + C = 0$$

Distance from origin:

$$d = \frac{| C |}{\sqrt{A^2 + B^2}}$$

8. Parallel Lines

Given line:

$$Ax + By + C = 0$$

Any parallel line:

$$Ax + By + K = 0$$

Rule: Coefficients of x and y remain same.

9. Perpendicular Lines

Given line: $Ax + By + C = 0$

Perpendicular line: $Bx - Ay + K = 0$

Shortcut

1. Interchange coefficients of x and y.
2. Change sign of one coefficient.

10. Family of Lines Through Intersection of Two Lines

Given: $a_1x + b_1y + c_1 = 0$

$a_2x + b_2y + c_2 = 0$

Family of lines: $(a_1x + b_1y + c_1) + \lambda(a_2x + b_2y + c_2) = 0$

where $\lambda$is a parameter.

FORMULA REVISION

Form	Equation
Parallel to x-axis	$y = b$
Parallel to y-axis	$x = a$
Slope	$\frac{y_2-y_1}{x_2-x_1}$
Slope-Intercept	$y = mx + c$
Point-Slope	$y - y_1 = m(x - x_1)$
Two-Point	$y - y_1 = \frac{y_2-y_1}{x_2-x_1}(x - x_1)$
Intercept Form	$\frac{x}{a} + \frac{y}{b} = 1$
Normal Form	$x\cos\alpha + y\sin\alpha = p$
General Form	$Ax + By + C = 0$