



Lines

Slopes, Intercepts & Equations

SLOPE

$$m = \frac{\text{rise}}{\text{run}} = \frac{\text{change in } y}{\text{change in } x} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}$$

- it's **positive** if the line rises to the right
- it's **negative** if the line falls to the right
- it's **zero** if the line is horizontal
- it's **undefined** if the line is vertical

SLOPE-INTERCEPT FORM

$$y = mx + b$$

where m = slope of the line
 b = y -intercept

POINT-SLOPE FORM

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

STANDARD FORM

$$Ax + By = C$$

A , B , C are integers; $A > 0$

FINDING INTERCEPTS

A. X-INTERCEPT

1. Set $y = 0$ in the equation.
2. Solve for x .

B. Y-INTERCEPT

1. Set $x = 0$ in the equation.
2. Solve for y .

PARALLEL LINES

Non-vertical lines are parallel if and only if they have the same slope and different y -intercepts.

(All vertical lines are parallel.)

PERPENDICULAR LINES

Non-vertical lines are perpendicular to each other if and only if their slopes are **negative reciprocals** of each other. This means the product of their slopes is -1 . If m is the slope of one line, then $-\frac{1}{m}$ is the slope of the other.

(Vertical lines are perpendicular to horizontal lines.)

DISTANCE FORMULA

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

MIDPOINT FORMULA

coordinates are: $\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$

VERTICAL & HORIZONTAL LINES

Vertical lines have equations of the form $x = a$. They are parallel to the y -axis. All points on the line have the same first coordinate.



Horizontal lines have equations of the form $y = b$. They are parallel to the x -axis. All points on the line have the same second coordinate.

