2.3 Linear Functions

Slopes of Lines

The slope of a line is a measure of the steepness of a line. Slope = m.
The slope of a line containing two points
is the ratio of the change in y-coordinate to the change in x-coordinates.

The Slope Formula to find the slope between two points (x_1,y_1) and (x_2,y_2) is:

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

Examples: Find slope between the given points.

1. (4, -1) and (-1, 3)

2. (1, 5) and (3, 5)

Finding the Equation of a Line

If given a point, (x_1, y_1) and the slope, m, then the equation can be written in

Point-Slope Form: $y - y_1 = m(x - x_1)$

If given two points on the line, first find the slope between the two points. Then use the same method for a given point and slope.

Examples:
Find an equation of the line that contains the given point and slope:

1. Point (2, 4), m = 3

2. Point (2, 3), m = $-\frac{1}{2}$

3. Point (-5,-1), m = undefined

4. $P_1 = (1,2)$ $P_2 = (2,4)$

Slope-Intercept Form

The equation of a line can be written in the form y = mx + b, when the y-intercept and the slope of the line are given.

When an equation is in the form *y = mx + b*, the slope = m, the y-intercept = b or (0, b).

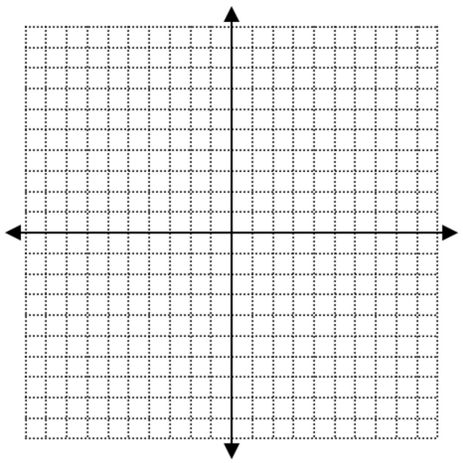
The line can be graphed by plotting the y-intercept and then using the slope to find additional points on the graph. Draw a line through the points, across the graph.

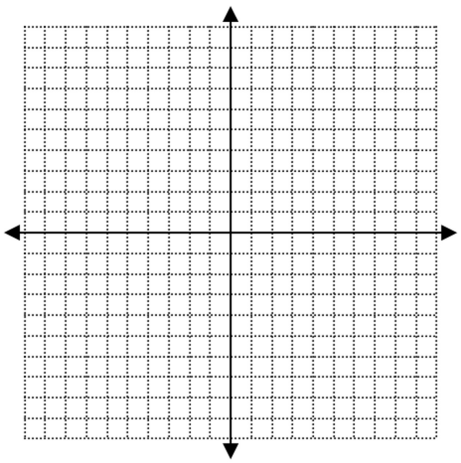
Be sure the equation is in *y = mx + b* form first

Examples:

1. Graph $y = -\frac{2}{3}x - 2$

2. Graph -2x + y = -3





Parallel and perpendicular lines

Two lines that have that do not intersect are called *parallel lines*. Parallel lines have the same slope.

Two lines that intersect at right angles are called *perpendicular lines*. Their slopes are opposite reciprocals (a/b and –b/a). If $m_1 \cdot m_2 = -1$, then the slopes are perpendicular.

Examples:

1. Determine if the line that contains the points (-2,3) and (5,-2) and the line that contains the points (2,4) and (-3,-3) are perpendicular, parallel, or neither.

2. Are the lines $2x - 4y = 3$ and $2x + 4y = -3$ parallel?

3. Find the equation of the line containing the point (2,1) and is parallel to the line $3x + y = -1$.

4. Find the equation of the line containing the point (1,-2) and is perpendicular to the line $y = \frac{3}{2}x - 2$