

Linear Equations

Throughout the material today we are going to deal with Linear Equations. We are going to be:

1. Finding the Slope of a line given a graph.
2. Finding the Slope of a line given two points.
3. Finding the Equation of a line given the slope & the y-intercept
4. Finding the Equation of a line given a graph.
5. Finding the Equation of a line given the slope & a point.
6. Finding the Equation of a line given two points.

Finding the Slope of a Line - Given a graph

What is slope?

- Rate of change
- How quickly something rises (Line goes up left to right)
- How quickly something falls (Line goes down left to right)

Procedure:

1. Identify the left most point

For summer school, where the arrow points.

2. Identify the right most point

For summer school, where the arrow points again.

3. Start by counting up/down from the left dot to the line where the right most dot falls onto. (Up = + , Down = -)

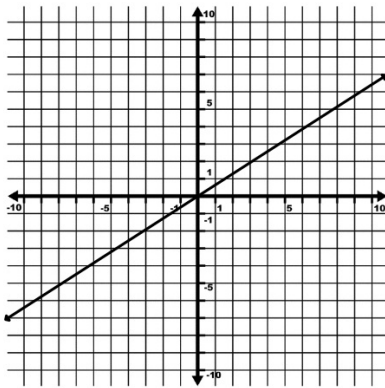
4. Count over to the right most dot.

5. Divide the answer from Step 3 by the answer from Step 4 and reduce the fraction to simplest form.

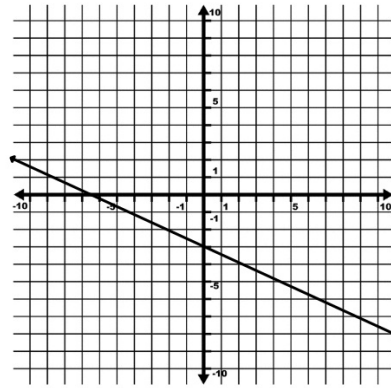
Examples

Find the slope of each of the following using the given graph:

1.



2.



Finding the Slope of a Line Given two points

Reminder:

- Ordered pairs are presented to you as (x, y)
- When given two ordered pairs consider labeling them as (x_1, y_1) and (x_2, y_2)

Procedure:

1. Label the given points as suggested above.
 (x_1, y_1) and (x_2, y_2)
2. Plug into the slope formula:

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

3. Simplify.

NOTE: Special cases when you have...

1. $\frac{0}{\#} = 0$

2. $\frac{\#}{0} = \text{UNDEFINED}$

Examples

Find the slope of the line containing the given points:

1. $(-5, -20)$ & $(9, 9)$

2. $(-3, 4)$ & $(4, 1)$

Finding the Equation of a Line Given the Slope and the Y-Intercept

What are you given?

- The m , which is the slope.
- The b , which is the y-intercept.

Procedure:

1. Recall SLOPE - INTERCEPT FORM of a linear equation
 $y = mx + b$
2. Plug in the given value of m for m .
3. Plug in the given value of b for b .

Note, if the given value of b is a negative, then it would be $y = mx - b$. The $+$ does not stay there.

Examples

Write the Linear Equation containing the following in
Slope - Intercept Form:

1. $m = -6$ & $b = 5$

2. $m = \frac{1}{3}$ & $b = -\frac{3}{4}$

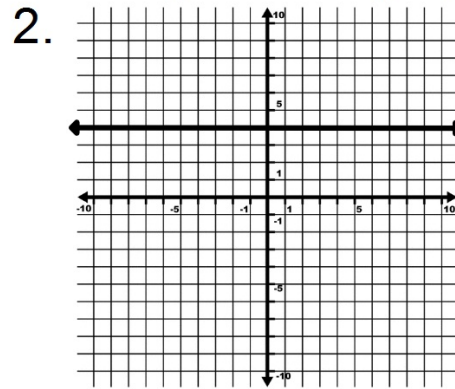
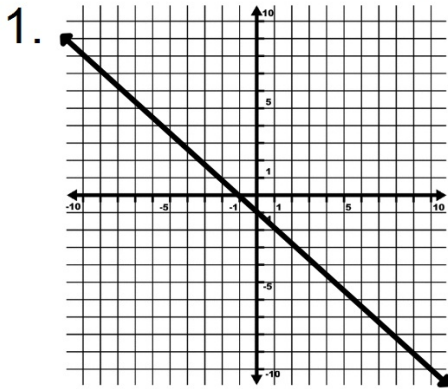
Finding the Equation of a Line Given a Graph

Procedure:

1. Identify the points where the arrows of the given line are at the ends of the graph.
2. Find the slope by using the counting method from the first technique in this set, or by using the slope formula.
3. Plug ONE of the points identified in Step 1 and the Slope that you found in Step 2 into the Slope-Intercept Form for a linear equation.
4. Solve for the missing variable b .
5. Rewrite $y = mx + b$
 - Plug in the m value found in Step 2
 - Plug in the b value found in Step 4
6. OPTIONAL
 - Check your equation by plugging in x from each pair identified in Step 1 and be sure the y value is right.

Examples

Write the Linear Equation of the line given the graph:



Finding the Equation of a Line Given the Slope and a point

Procedure:

1. Plug the point (x, y) into the equation $y = mx + b$ for the x and the y .

NOTE: The most common mistake I see here is people plugging in like the equation is $x = my + b$.

2. Plug in the m into the equation.
3. Solve for the missing variable b .
4. Rewrite $y = mx + b$

Plug in the given m value

Plug in the b value found in Step 3

Examples

Write the Linear Equation containing the following in
Slope - Intercept Form:

1. $(3, -3)$ & $m = -6$

2. $(-5, 12)$ & $m = 3$

Finding the Equation of a Line Given two points

Procedure:

1. Label the given points as (x_1, y_1) and (x_2, y_2) .
2. Plug into the slope formula and find the slope

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

3. Choose ONE of the given points and the slope we just found and plug them into the equation $y = mx + b$.
4. Solve for b .
5. Rewrite $y = mx + b$
 Plug in the m value found in Step 2
 Plug in the b value found in Step 4

Examples

Write the Linear Equation containing the following in
Slope - Intercept Form:

1. $(0, -1)$ & $(5, -5)$

2. $(8, -9)$ & $(-8, -11)$