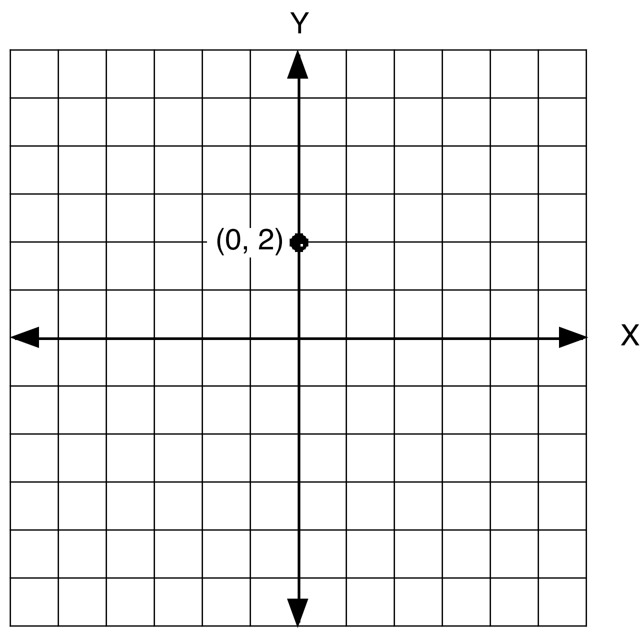
Lesson 7B Graphing a Line from the Slope-Intercept Formula

Graphing a Line The inverse of finding the slope-intercept formula of a line is graphing a line when you are given the slope-intercept formula. In figure 1, we are given the formula as Y = 3X + 2.

Figure 1

Graph Y = 3X + 2



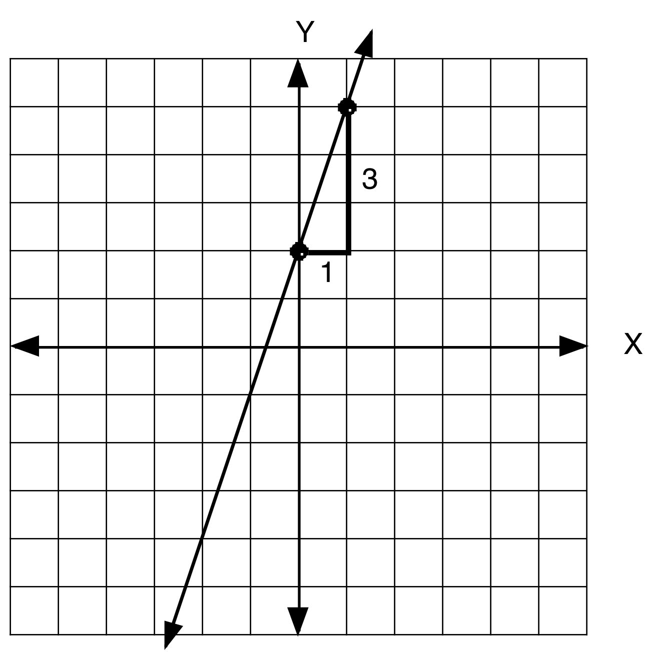
We'll begin by locating the intercept. Looking at the graph, it appears to be at the point (0, 2).

We can solve for *b* by using algebra.
Since the coordinate of X is 0 at the intercept, we can make X = 0 in Y = 3X + 2.

Substituting for X:
Y = 3(0) + 2
Y = 0 + 2
Y = 2

So if X = 0, then Y = 2, and the intercept is (0, 2).

Let's draw that point on the graph.



Now let's estimate the slope. Since the slope is 3, or +3, then the slope is positive and leaning toward the right.

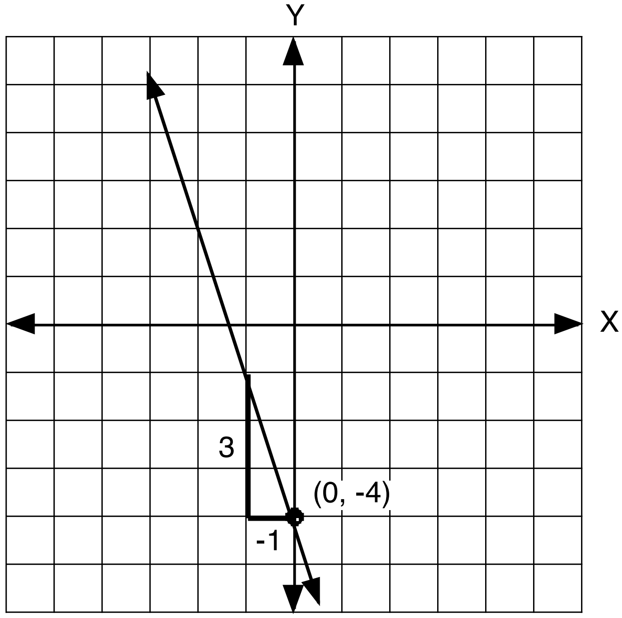
We know the slope is the coefficient of X. It is 3, which is the same as +3, or +3/+1, and has a rise of +3 and a run of +1.

Beginning at the intercept (0, 2), we draw a triangle with a run (over) +1 and a rise (up) +3. This brings us to the point (1, 5).

If we connect the two points, we have a line representing Y = 3X + 2

Figure 2

Graph Y = -3X - 4



We begin by estimating the slope. Since the slope is -3, then the slope is going to be negative and leaning toward the left.

To find the intercept, we make X equal to 0. Substituting this value into the equation:

Y = -3(0) -4

Y = 0 -4

Y = -4

When X = 0, then Y = -4, and the intercept is (0, -4).

Or, we could have used the information from the slope-intercept formula. Y = mX + b; where m is the slope, and b is the intercept. In Y = -3X - 4, the intercept, or b, is -4.

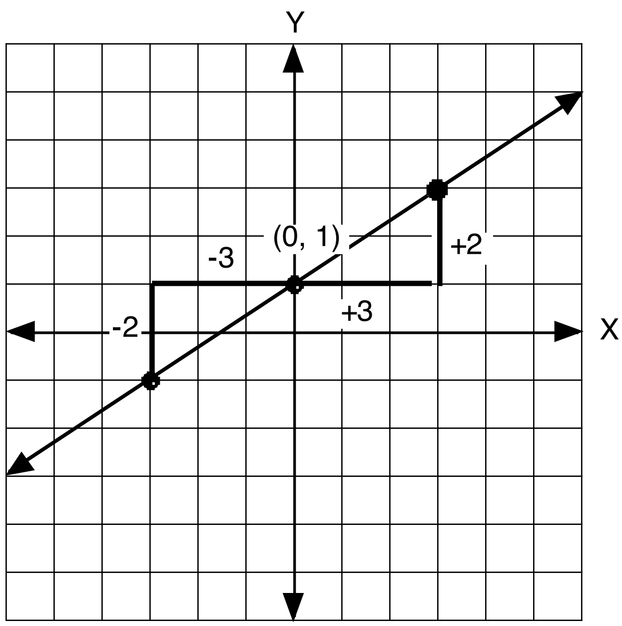
In Y = -3X - 4, the slope, or m, is the coefficient of X and is -3. This could be -3/+1, or +3/-1.

Beginning at (0, -4), we chose to construct a triangle with a run of -1 and a rise of +3.

After drawing a line through the points (0, -4) and (-1, -1), we have a graphic representation of the line described as Y = -3X - 4.

Figure 3

Graph Y = 2/3 X + 1



We begin by estimating the slope. Since the slope is 2/3, or +2/3, then the slope is going to be positive and leaning toward the right.

Find the intercept by making X equal to 0, or by using the slope-intercept formula.

The intercept is 1, and we plot the point (0, 1).

We can see that the slope is 2/3, since it is the coefficient of, or what is multiplied times, X. Beginning at (0, 1), we construct a triangle with a run of +3 and a rise of +2.

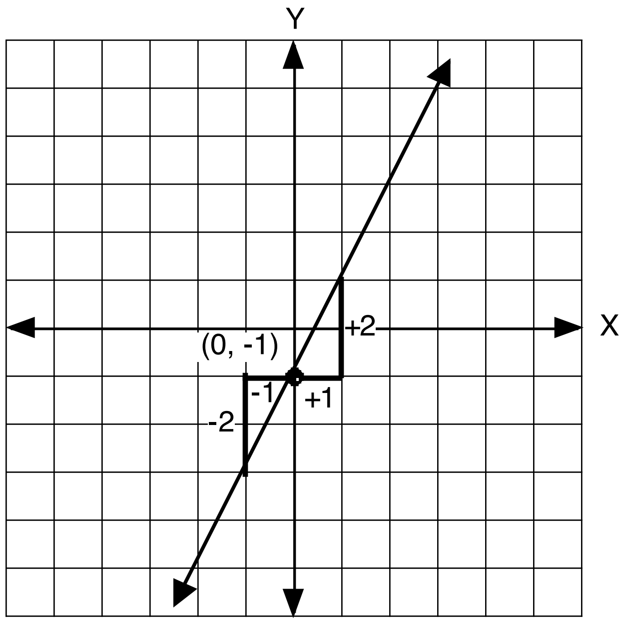
Notice that we could also make a triangle with a run of (-3) and a rise of (-2).

$$\frac{2}{3} = \frac{+2}{+3} = \frac{-2}{-3}$$

After connecting the points (0, 1) and (-3, -1), or the points (0, 1) and (3, 3), we have a graphic representation of the line described as Y = 2/3 X + 1.

Figure 4

Graph Y = 2X - 1



We begin by estimating the slope. Since the slope is 2, or +2, then the slope is going to be positive and leaning toward the right.

To find the intercept, we make X equal to 0. Substituting this value into the equation:

Y = 2(0) -1

Y = 0 -1

Y = -1

When X = 0, then Y = -1, and the intercept is (0,-1)

Or, we could have used the information from the slope-intercept formula. Y = mX + b; where m is the slope and b, is the intercept. In Y = 2X -1, the intercept, or b, is -1.

In Y = 2X - 1, the slope, or m, is the coefficient of X, and is 2. This could be +2/+1, or -2/-1.

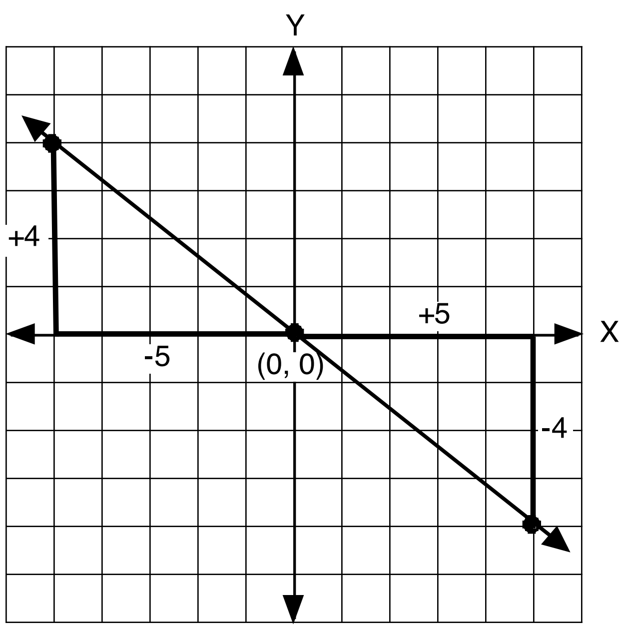
Beginning at (0, -1), we construct a triangle with a run of +1 and a rise of +2.

Notice that we could also make a triangle with a run of (-1) and a rise of (-2).

After drawing a line through the points (0, -1) and (+1, +1), or the points (0, -1) and (-1, -3), we have a graphic representation of the line described as Y = 2X - 1.

Figure 5

Graph Y = -4/5 X



We begin by estimating the slope. Since the slope is -4/5, the slope is negative and leaning toward the left.

Find the intercept by making X equal to 0, or by using the slope-intercept formula.

The intercept is 0, and we plot the point (0, 0).

This line will go through (0, 0), or the origin.

We can see the slope is -4/5, since it is the coefficient of X. This could be +4/-5, or -4/+5.

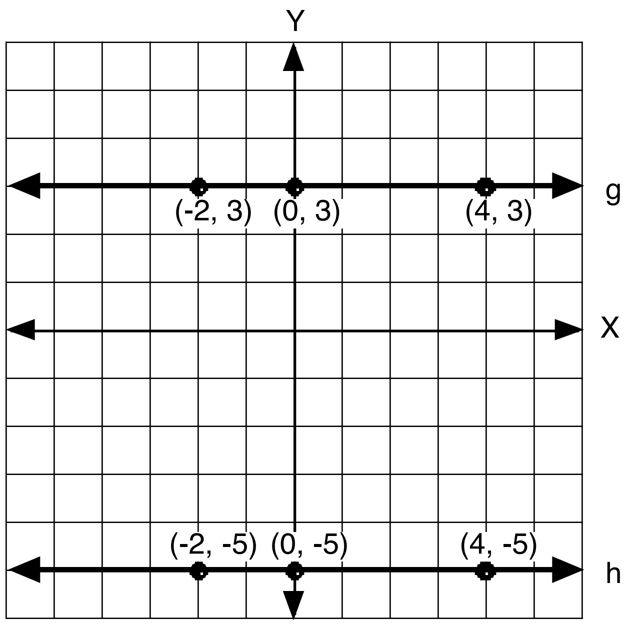
Beginning at (0, 0), we construct a triangle with a run of +5 and a rise of -4.

Notice that we could also make a triangle with a run of (-5) and a rise of (+4).

After connecting the points (0, 0) and (-5, +4), or the points (0, 0) and (+5, -4), we have a graphic representation of the line described as Y = 4/5 X.

Horizontal and Vertical Lines There are lines that don't seem to have any slope at all. They may be either horizontal or vertical.

Figure 6 Find the equation of the line for each horizontal line.



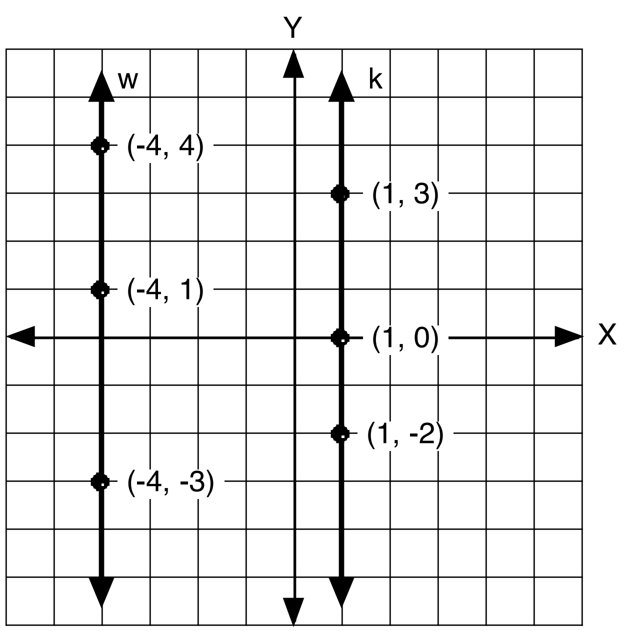
Notice line *g*. Observe that every point along that line has one coordinate that is the same. All three points have a Y-coordinate of 3. In fact, every single point along this line has a Y-coordinate of 3.

The slope of any line is the rise over the run. In the case of line *g*, moving from the point (0, 3) to the point at (4, 3), the rise is 0 and the run is +4. The slope of line *g* is 0/4, or $0 \div 4$ which is 0.

If we use the slope-intercept formula, we have Y = 0X + 3. This simplifies to Y = 3, the same equation given above. So the equation of this line is Y = 3.

What is the equation of line *h*?
If you said Y = -5, you are correct.

Figure 7 Find the equation of the line for each vertical line.



Now that you know horizontal lines, you could surmise that vertical lines will be X = some number, and you would be correct.

Figure 5 has two lines, *k* and *w*. Notice that the three points on each line have the same X-coordinate. In fact, every single point along these lines also has the same X-coordinate.

The equation of line *k* is X = 1.

The equation of line *w* is X = -4.

The slope of line *k* is rise over run, which is 3 over 0, or 3/0, between the points (1, 0) and (1, 3). However, you cannot divide a number by 0.
We say that 3/0, or $3 \div 0$, is <u>undefined</u>. There is no answer which when multiplied by 0 will yield 3.

To summarize, the slope of a horizontal line is always zero, and the slope of a vertical line is always undefined.