

Graphing Linear Equations

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In order to plot the graph of a linear equation, we solve the equation for y in terms of x , then we assign values for x and find the value of y that corresponds to that x . Each x and y , called an ordered pair (x, y) , represents the coordinate of a point on the graph.

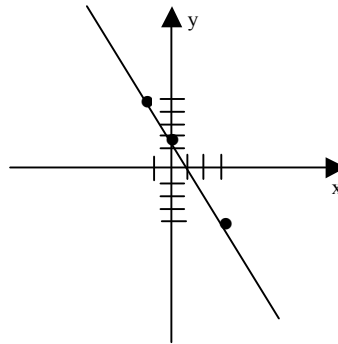
EXAMPLE: $3x + y = 2$

Solving for y , I subtract $3x$ from both sides.

$$y = 2 - 3x$$

When I assign values for x , I get these y values:

x	y
0	2
2	-4
-1	5



Rewriting as ordered pairs: $(0, 2)$, $(2, -4)$, $(-1, 5)$ as plotting the graph. When I connect those three points I get a straight line, called a LINEAR equation.

I could have chosen any values for x and found the corresponding y . However, it is easier to choose a convenient number, like zero, one, or two. Choosing a number like 100 would make my graph a lot larger. Or, I could have chosen a fraction, but that can be messy.

EXAMPLE: $x - 3y = 8$

Again, I solve for y in terms of x

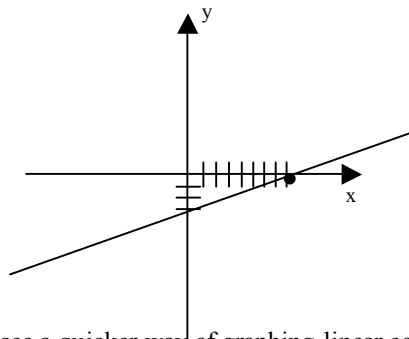
$$x - 8 = 3y$$

$$\frac{x - 8}{3} = y$$

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Assign values for x and find the corresponding y 's. The ordered pairs $(0, -\frac{8}{3})$, $(8, 0)$, and $(5, -1)$ represent the points on the graph.

x	y
0	$-\frac{8}{3}$
8	0
5	-1



If we did enough of these problems we would see a quicker way of graphing linear equations. First, all linear equations are graphs of lines, therefore all we need do is graph two points. Second, we would see that the value

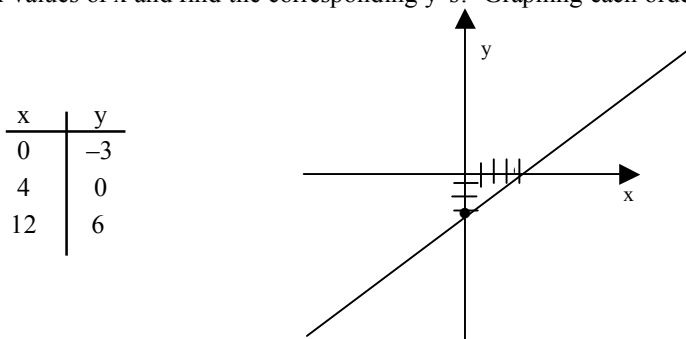
of x when the graph crosses the y -axis is always zero. Look at the last two examples. What's the value of y when the graph crosses the x -axis? Look at the graphs we've already plotted, when the graph crosses the x -axis, the value of y is zero.

Let's look at another example, first we'll plot the graph as we did in the previous two examples, then we'll look at a short cut.

EXAMPLE: $3x - 4y = 12$
 Solving for y , we get $3x - 12 = 4y$

$$\frac{3x - 12}{4} = y$$

Now, assign values of x and find the corresponding y 's. Graphing each ordered pair, our graph looks like this:



If we take the same problem and realize the graph crosses the x -axis when $y = 0$, and crosses the y -axis when $x = 0$, watch what happens.

EXAMPLE: $3x - 4y = 12$

When $x = 0$, the $3x$ falls out of the problem, so $-4y = 12$ or $y = -3$. When $y = 0$, the $-4y$ falls out, so we get $3x = 12$, or $x = 4$. Notice, $(0, -3)$ and $(4, 0)$ were ordered pairs doing the problem the other way. Look on the chart. All we need do is plot the point just like before and we're done.

Try this example: $2x + 3y = 6$
 When $x = 0$, $3y = 6$, therefore $y = 2$
 When $y = 0$, $2x = 6$ therefore $x = 3$

Plot $(0, 2)$ and $(3, 0)$ and you're done. That beats solving for y and plugging in values for x .

Recognizing patterns is important in mathematics – it means the difference between doing problems quickly without arithmetic mistakes or trudging through.

It's also important to know vocabulary. We've discussed where the graph of the line crosses the x -axis, we call that the x -intercept. Where the graph crosses the y -axis is called the y -intercept. The x -intercept occurs when y is zero. The y -intercept occurs when x is zero.

Let's try these examples:

- 1) $2x + 3y = 6$
- 2) $y = \frac{3}{4}x - 1$
- 3) $5x - 2y = 10$