Lines and Graphing

When it comes to lines, there are two main forms that we are going to come in contact with:

1) $y = ax + b$ (Seen usually as $y = mx + b$. This is called "slope-intercept form" for reasons we shall see later. Why "m" is used is unknown.)

2) $Ax + By = C$ (This is called "standard form".)

In both of these cases, "x" and "y" are the variables and the other numbers are generally given to us and are called "constants".

Finding points on a line

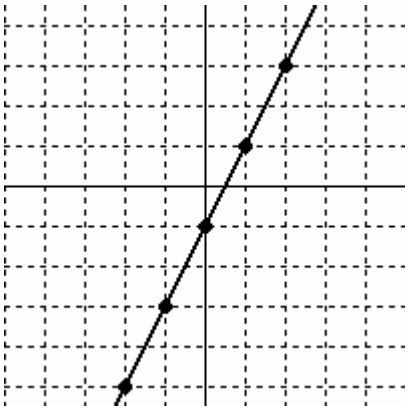
There are several ways to graph a line. The points we pick to plug in for "x" depend on what form the line is in. Technically, we can plug in anything we want, but if we aren't a little more discriminating in the values we pick, we may end up with values that are not very nice to graph (like fractions).

Also, we really only need two points, but the more points we have, the better we can see the pattern of the line. One point we always want to plug in is $x = 0$ because it is a special point: the value we get for "y" when we plug in $x = 0$ is called the "y-intercept" because it is where the line intersects the y-axis.

Remember, when we plug in values for "x", we use PEMDAS to simplify them.

A) $y = mx + b$, when "m" is an integer (-4, -3, -2, -1, 0, 1, 2, 3, …)
Plug in -2, -1, 0, 1, 2 for x and see what values you get for y.

Example: $y = 2x - 1$



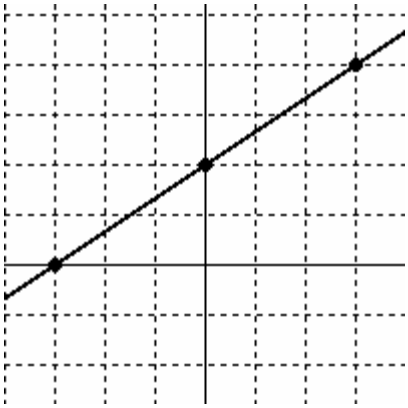
x	y
-2	-5
-1	-3
0	-1
1	1
2	3

$2(-2) - 1 = -4 - 1 = -5$
$2(-1) - 1 = -2 - 1 = -3$
$2(0) - 1 = 0 - 1 = -1$
$2(1) - 1 = 2 - 1 = 1$
$2(2) - 1 = 4 - 1 = 3$

B) y = mx + b, when "m" is a fraction and "b" is an integer

Plug in values for "x" that are multiples of the denominator of the fraction in front of "m". Don't forget that you can include negatives also.

Example: $y = \frac{2}{3}x + 2$



x	y
-3	0
0	2
3	4

$\frac{2}{3}(-3) + 2 = -2 + 2 = 0$

$\frac{2}{3}(0) + 2 = 0 + 2 = 2$

$\frac{2}{3}(3) + 2 = 2 + 2 = 4$

C) Ax + By = C

There are two things you can do with an equation in this form. You can

i) Solve for "y" like we practiced in chapter 2 and follow the directions above.

Example: 2x + 3y = 6

$$\begin{array}{rl} -2x & -2x \\ \hline 3y = 6 - 2x & \end{array}$$

Subtract 2x from each side.

Divide each side by 3.

$$\frac{3y}{3} = \frac{6}{3} - \frac{2x}{3}$$

$$y = 2 - \frac{2}{3}x$$

ii) Plug in x = 0 and solve for "y" to get one point and then plug in y = 0 and solve for "x" to get a second point. Remember, all we need are two points to make a line.

Example: 2x + 3y = 6

If x = 0:

2(0) + 3y = 6

0 + 3y = 6

3y = 6

y = 2

If y = 0:

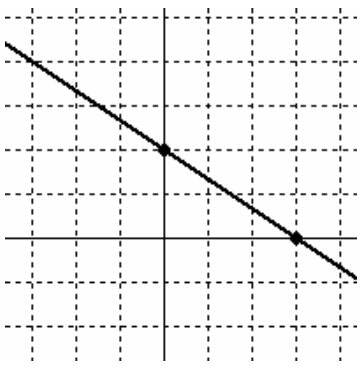
2x + 3(0) = 6

2x + 0 = 6

2x = 6

x = 3

x	y
0	2
3	0



If a line is not in either of these forms, you can use what you learned in chapter 2 to put it in one of these two forms and progress from there. Most people like to put lines into the slope-intercept form ($y = mx + b$). Let's practice this a couple of times.

Write the following in both $y = mx + b$ and $Ax + By = C$ forms.

1) $-y = 4x - 3$

$y = mx + b$ form	$Ax + By = C$ form
$-y = 4x - 3$	$-y = 4x - 3$

2) $2y = 3x - 12$

$y = mx + b$ form	$Ax + By = C$ form
$2y = 3x - 12$	$2y = 3x - 12$

3) $4x = 5y - 20$

$y = mx + b$ form	$Ax + By = C$ form
$4x = 5y - 20$	$4x = 5y - 20$