We will graph equations by plotting points. Later we will learn to graph a line by looking at its equation.

Elementary Algebra
Class Notes
Graphing Linear Equations (section 10.2)

Definition: Linear Equation: a linear equation in two variables is an equation that *could be written* in the form $Ax + By = C$ where A, B, and C are real numbers and A and B are not both zero.

Why would we say that A and B are not both zero?

Graphs of linear equations will be perfectly straight lines.

Which of the following are linear equations?

$3x + 4y = 15$ $\quad y = 4$

$\frac{1}{2}x - 7y = 10$ $\quad y = 3x + 4$ $\quad 6x = 12$ $\quad 4x^2 + 5y = 12$

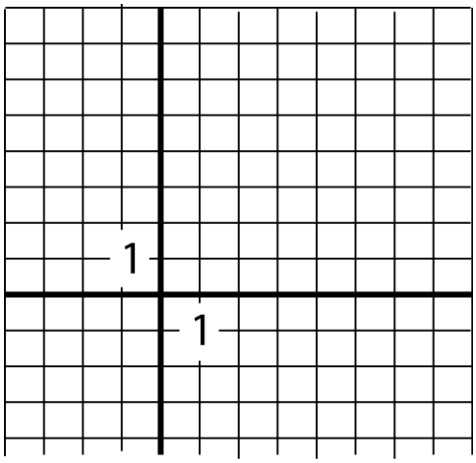
You might try to write the linear equations above in the form $Ax + By = C$, which is called the **standard form**. We will investigate the slope-intercept and point-slope forms in the sections to come.

We will investigate graphs of linear equations here. The idea behind a graph is that it shows every single point that makes the equation true. Another way to say this is that the points "satisfy the equation".

Points are in the form (x, y).

expl 1: Graph $4x + 2y = 8$. Complete the table to find a few points. Then plot them and connect with a line using a straight edge.

x	***y***
0	
	0
-2	



By connecting the three points above with a straight line, we are saying that all the points in between and continuing forever on this line also make the equation true. That is very cool, if you think about it. What's more, these are the **only** points that would make the equation true.

Find another point on your line from the graph and verify that it does make the equation true.

Another way to think about this is that the equation $4x + 2y = 8$ **tells you what is true for every point on the line**. Take any point on the line and it will always be true that "4 times the x value plus 2 times the y value will equal 8".

Exploration of the Line $y = mx + b$:

Use your calculator to graph the following sets of lines on the same screen. Use the window [-10, 10] x [-5, 5]. Answer the questions that follow.

Use TRACE key and the up/down arrows to move among the graphs.

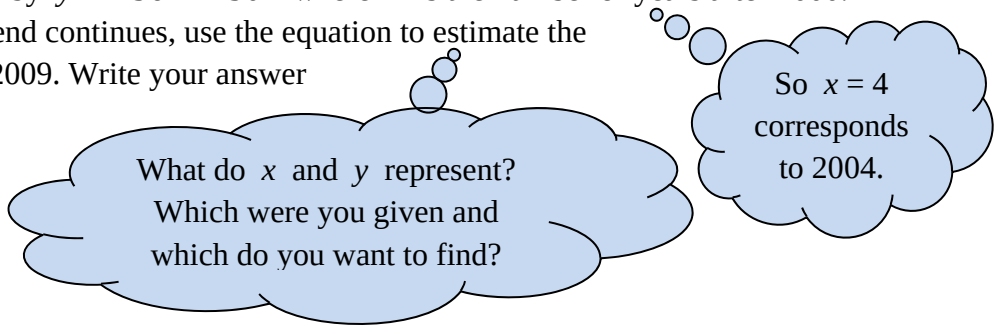
$y = 2x + 4$
$y = 2x$
$y = 2x - 3$

What are the similarities and differences among the graphs? Where do they cross the y-axis?

Considering the y-intercepts of the above graphs, where do you think $y = 2x - 8$ would cross the y-axis? Graph it, lowering your *ymin* to -10 to check.

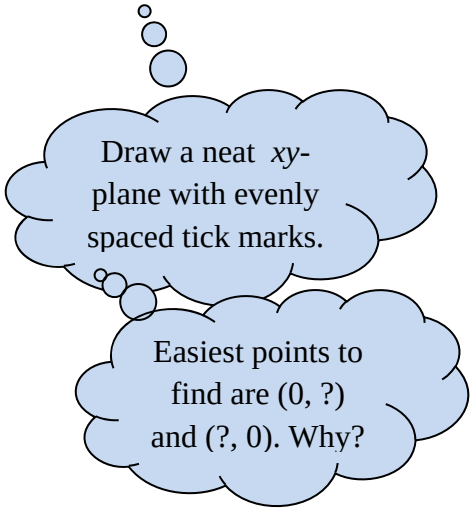
In general, where would $y = mx + b$ cross the y-axis?

expl 2: The US silver production (in metric tons) from 2000 to 2004 has been steadily dropping, and can be approximated by $y = -196x + 1904$ where x is the number of years after 2000. Assuming this current trend continues, use the equation to estimate the US silver production in 2009. Write your answer as a sentence.



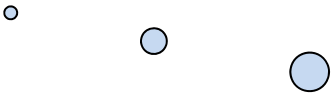
expl 3: Write the statement as an equation in two variables and then graph it.

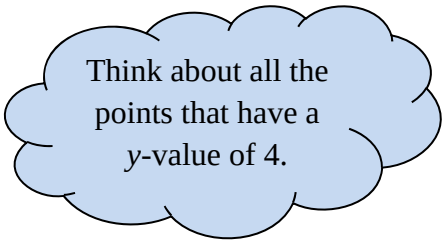
Five times the x-value, added to twice the y-value is -10.



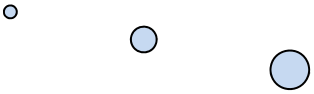
expl 4: Graph the lines below.

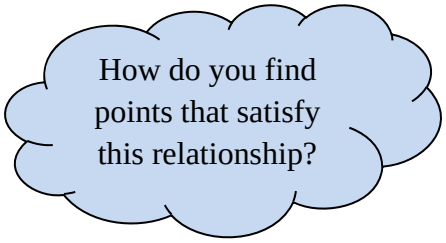
a.) $y = 4$





b.) $3x + y = 6$





c.) $x = -2$