

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

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.

Graphs of linear equations will be perfectly straight lines.

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

Which of the following are linear equations?

$3x + 4y = 15$

$y = 4$

$\frac{1}{2}x - 7y = 10$

$y = 3x + 4$

$6x = 12$

$4x^2 + 5y = 12$

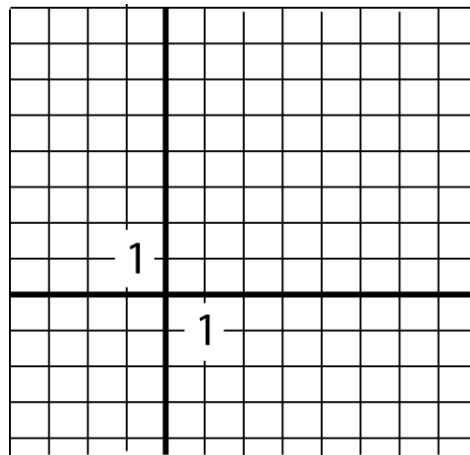
You might try to write the linear equations above in the form $Ax + By = C$, which is called the **standard form**. We will investigate the slope-intercept and point-slope forms in the sections to come.

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) .

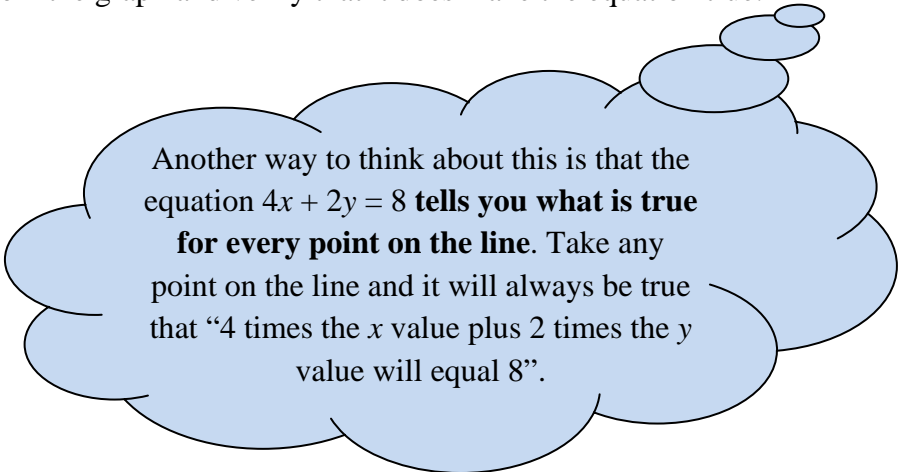
expl 1: Graph $4x + 2y = 8$. Complete the table to find a few points. Then plot them and connect with a line using a straight edge.

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.



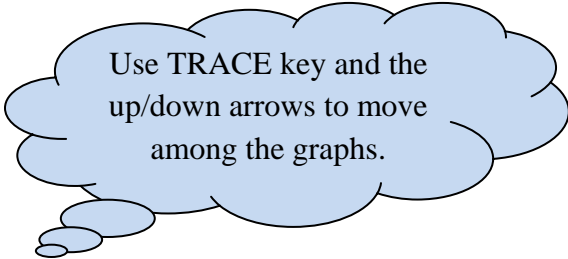
Exploration of the Line $y = mx + b$:

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

$$y = 2x + 4$$

$$y = 2x$$

$$y = 2x - 3$$

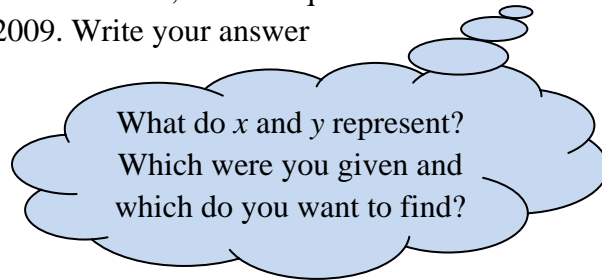


What are the similarities and differences among the graphs? Where do they cross the y -axis?

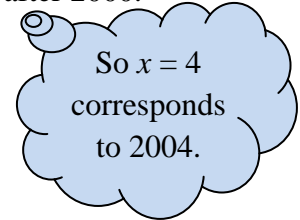
Considering the y -intercepts of the above graphs, where do you think $y = 2x - 8$ would cross the y -axis? Graph it, lowering your $ymin$ to -10 to check.

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.



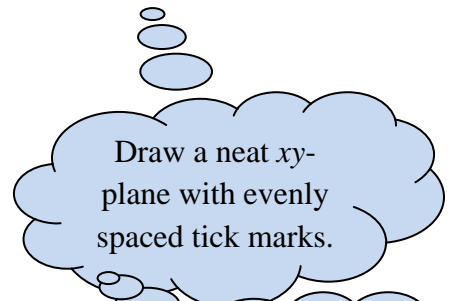
What do x and y represent?
Which were you given and which do you want to find?



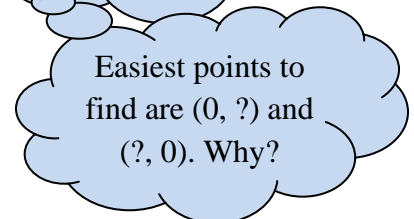
So $x = 4$ corresponds to 2004.

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 .



Draw a neat xy -plane with evenly spaced tick marks.



Easiest points to find are $(0, ?)$ and $(?, 0)$. Why?