

Linear Equations in 2 Variables

A **linear equation in 2 variables** is an equation with only 2 variables each to the first power in separate terms. For example $3x + 3 = 2y$

A **solution** to an equation in 2 variables is an ordered pair whose values make the equation a true statement, for a linear equation in 2 variables there will be an infinite set of ordered pair solutions, which when plotted form a line.

If you are given the x or y value of an ordered pair, plug it into the equation to get the other one. This is called **substitution**.

The **Standard form of the equation of a line** is $Ax + By = C$.

Method 1 for Graphing Linear Equations

- 1) Choose 3 x or y values, unless you have been given values to use.
 - a. Some easy choices, $x = 0$, $y = 0$ & $x = 1$ or $y = 1$.
- 2) Plug each of those into the equation & solve for the other variable
- 3) Plot each of the 3 ordered pairs
- 4) Connect the 3 plotted points.

The reason for choosing 3 points is to make sure you did not make a mistake. So I require 3 points on all work that is turned in for credit.

The **y-intercept** is where a line crosses the y-axis, $(0, b)$.

To find the y-intercept

- 1) Let $x = 0$
- 2) Solve for y.

The **x-intercept** is where a line crosses the x-axis, $(a, 0)$.

To find the x-intercept

- 1) Let $y = 0$
- 2) Solve for x.

Note: The intercepts are useful for graphing lines, these are the points recommended in Step 1, above.

Examples:

1) $y + 3 = -\frac{1}{7}x$ In this case $x = \pm 7$ are 2 very good choices. I will also choose $x = 0$.

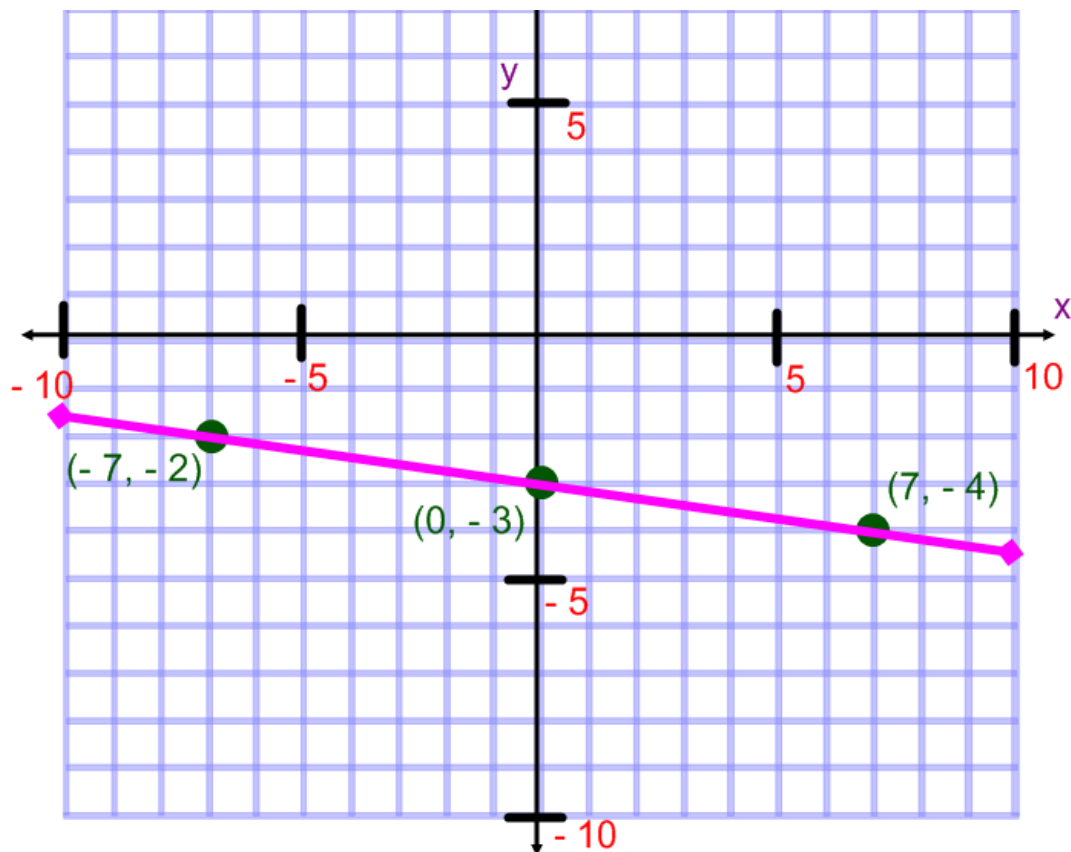
x	y	(x, y)
0	-3	(0, -3)
7	-4	(7, -4)
-7	-2	(-7, -2)

$y + 3 = -\frac{1}{7}(0) \rightarrow y + 3 = 0 \xrightarrow{-3 \text{ from each side}} y = -3$

$y + 3 = -\frac{1}{7}(7) \xrightarrow{\text{cancel}(7)} y + 3 = -1 \xrightarrow{-3 \text{ from each side}} y = -4$

$y + 3 = -\frac{1}{7}(-7) \xrightarrow{\text{cancel}(-7)} y + 3 = 1 \xrightarrow{-3 \text{ from each side}} y = -2$

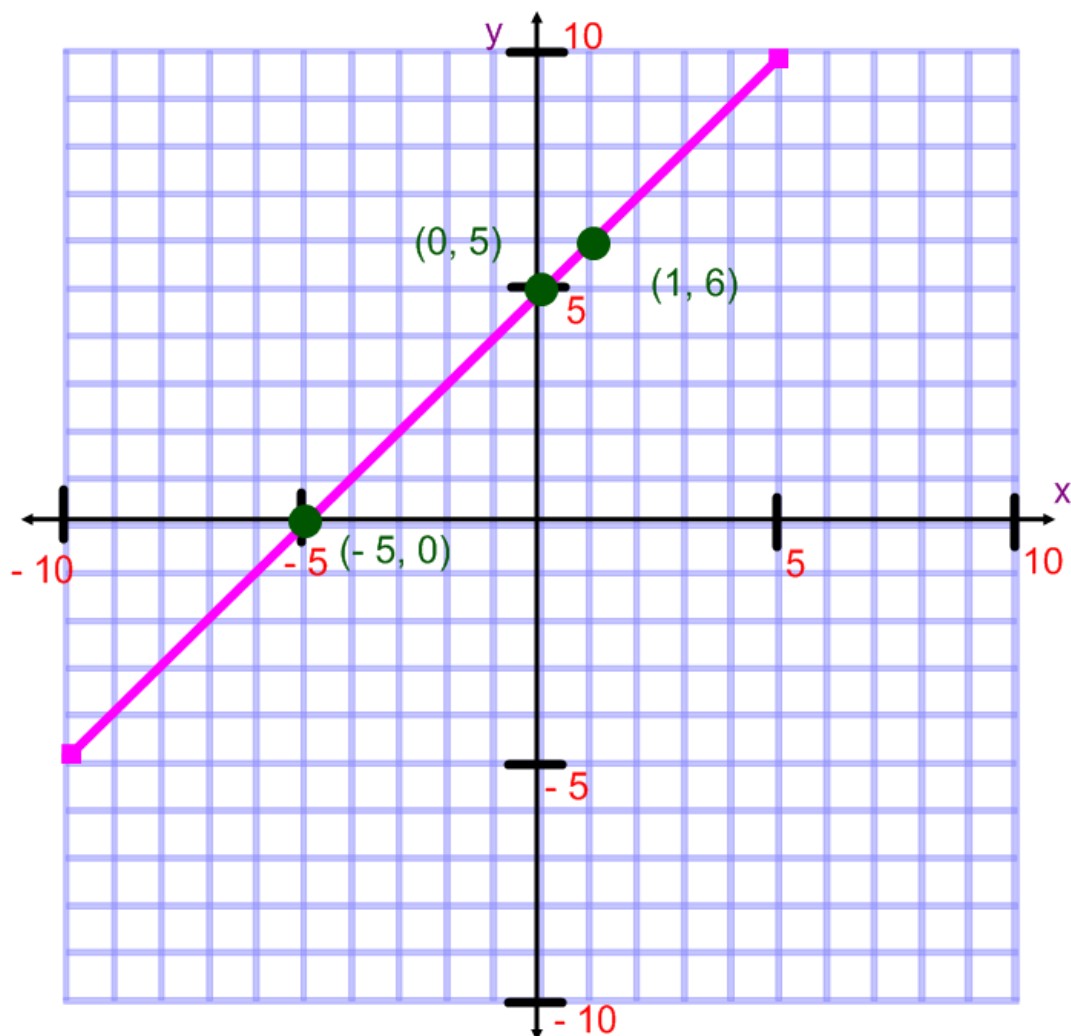
Now plot the ordered pairs: (0, -3); (7, -4); (-7, -2). Then draw a line connecting them, don't forget the arrows on the end to show that the line keeps going.



2) Graph: $-2x + 2y = 10$. First you would need to find the x-intercept & the y-intercept. I would set up the table as above, and find the 3rd point too using $x = 1$.

x	y	(x, y)	
0	5	(0, 5)	$-2(0) + 2y = 10 \rightarrow 2y = 10 \rightarrow$ Divide both sides by 2 $\rightarrow y = 5$
-5	0	(-5, 0)	$-2x + 2(0) = 10 \rightarrow -2x = 10 \rightarrow$ Divide both sides by -2 $\rightarrow x = -5$
1	6	(1, 6)	$-2(1) + 2y = 10 \rightarrow -2 + 2y = 10 \rightarrow +2$ to each side $\rightarrow 2y = 12 \rightarrow y = 6$

Now plot the ordered pairs: (0, 5); (-5, 0); (1, 6). Then draw a line connecting them, don't forget the arrows on the end to show that the line keeps going.



In the Standard Form, $Ax + By = C$:

- If $A = 0$ & $B = 1$, this is called a **constant function**, $y = C$, the **horizontal line** passing $(0, C)$. **Note:** This tells us the y-intercept and that there is no x-intercept.
- If $A = 1$ & $B = 0$, this is a **vertical line**, $x = C$, passing through $(C, 0)$. **Note:** this tells us the x-intercept & there is no y-intercept.

Examples:

$y = 4$; $y = -3$; $y = 15$ are all horizontal lines.

$x = -5$; $x = 9$; $x = 657$ are all vertical lines.

