Graphing Linear Equations in Two Variables

Definition

A linear equation in two variables is an equation of the form $Ax + By = C$, A & B not both zero.

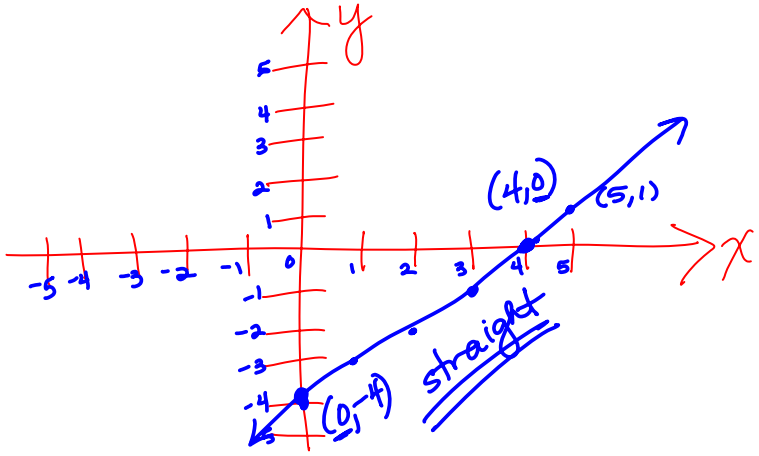
Solutions to Lin. Eq. in two variables are ordered pairs (x, y) that satisfy the eq.

Example: Find solutions to $x - y = 4$.

x	y
5	1
4	0
3	-1
2	-2
1	-3
0	-4
4.1	.1

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

Graph $x - y = 4$.



Notice that there are infinitely many solutions to this equation. Also, note that all solutions form a straight line.

Two important points on the graph:

x-intercept: (#, 0) — x-axis

y-intercept: (0, #) — y-axis

To graph an eq. of the form $Ax + By = C$:

1. make a chart & substitute #'s for x & solve for y.
2. Find x & y intercepts

Example: Graph $2x - y = -4$.

$2x - y = -4$

x	y	(x,y)
1	6	(1,6)
0	4	(0,4) ✓
-1	2	(-1,2)

$2(1) - y = -4$
$2 - y = -4$
$-2 \quad -2$
$-y = -6$
$y = 6$

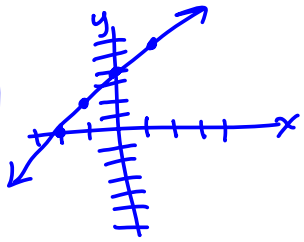
x	y	(x,y)
-2	0	(-2,0)
0	4	(0,4)

$2(0) - y = -4$
$0 - y = -4$
$-y = -4$
$y = 4$

$2x - 0 = -4$
$2x = -4$
$x = -2$

$2(-1) - y = -4$
$-2 - y = -4$
$+2 \quad +2$
$-y = -2$
$y = 2$

$2x - y = -4$
$-y = -4$
$y = 4$



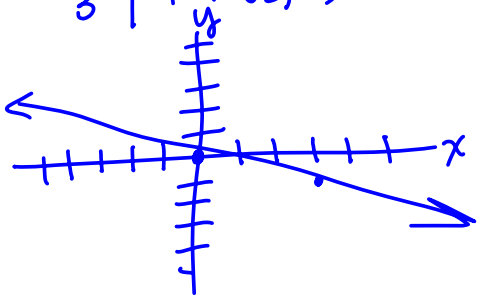
Ex. Graph $x + 3y = 0$.

x	y	(x,y)
0	0	(0,0)
0	0	(0,0)
3	-1	(3,-1)

$x + 3(0) = 0$
$x = 0$

$0 + 3y = 0$
$3y = 0$
$y = 0$

$3 + 3y = 0$
$-3 \quad -3$
$3y = -3$
$y = -1$



Another form of a linear eq. is $y = mx + b$. *

$AX + By = C$

$x - y = 4$

$-x \quad -x$

$-y = -x + 4$

$\frac{-y}{-1} = \frac{-x}{-1} + \frac{4}{-1}$

$y = x - 4$

To graph eq. of this form, simply plug in values for x & solve for y.

Ex. $y = \frac{1}{2}x - 2$.

x	y	
−2	−3	(−2, −3)
0	−2	(0, −2)
2	−1	(2, −1)

$y = \frac{1}{2}(-2) - 2$

$y = -3$

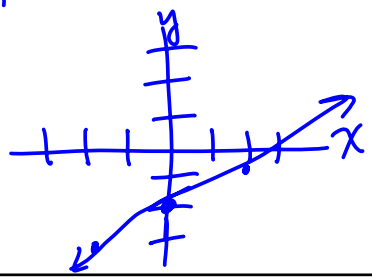
$y = \frac{1}{2}(0) - 2$

$y = -2$

$y = \frac{1}{2}(2) - 2$

$y = 1 - 2$

$y = -1$



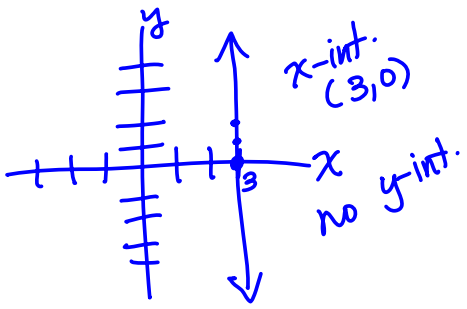
Special Forms:

$x = \#$ vertical line

$x = 3$

x	y
3	0
3	1
3	2

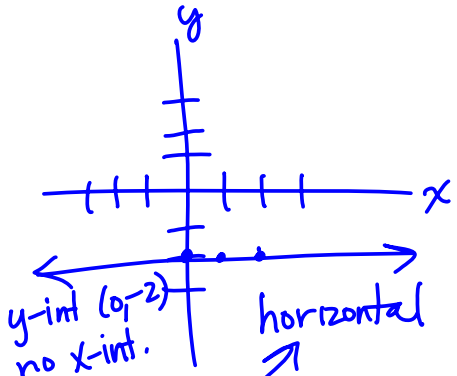
$x + 0y = 3$



$y = -2$

$0x + y = -2$

x	y
0	-2
1	-2
2	-2



$y = \#$