

## Linear Equations in Two Variables

**To graph an equation of the form  $y = mx + b$**

Any equation of the form  $y = mx + b$ , where  $m$  and  $b$  are constants is a linear equation in two variables ( $y$  and  $x$ ). The graph is a straight line.

Examples of linear equations:

$$y = 3x + 2$$

$$y = x - 5$$

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

$$y = 1 - 2x$$

Note: To be a linear equation the exponent on each variable ( $y$  and  $x$ ) must be the first power (exponent of 1).

**To graph a linear equation:**

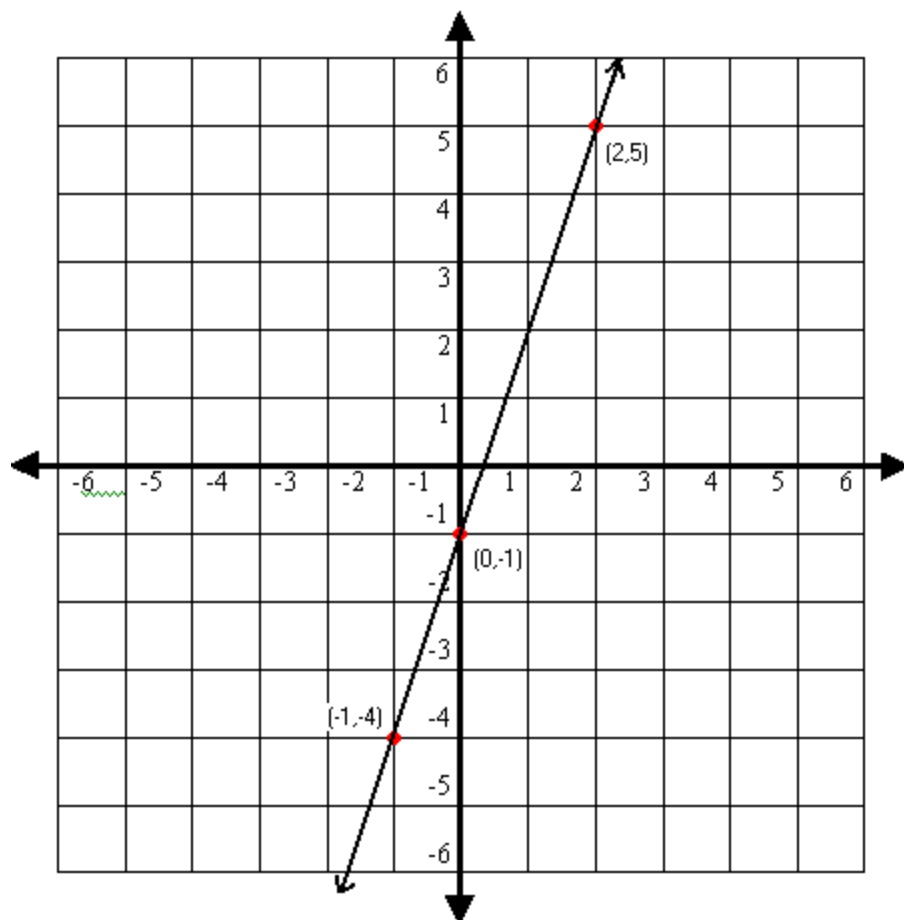
- (1) Choose some values for  $x$  and then find the corresponding values for  $y$ .
- (2) Next plot these points on your graph
- (3) Connect the points with a straight line.

**Example:** Graph  $y = 3x - 1$

First, we must find some points by choosing values for  $x$

$x$	$y = 3x - 1$	$y$	$(x,y)$
-1	$y = 3(-1) - 1$	-4	$(-2,-4)$
0	$y = 3(0) - 1$	-1	$(0,-1)$
2	$y = 3(2) - 1$	5	$(2,5)$

Next, we will plot these points and draw our line



**To graph an equation of the form  $Ax + By = C$**

The equation  $Ax + By = C$ , where A, B, and C are constants is also a linear equation because the exponents for x and y are the first power (1).  $Ax + By = C$  is known as the standard form of a linear equation.

When trying to graph these equations, it is helpful to first solve the equation for y. Once you have the equation solved for y, then you can follow the same steps in graphing the equation as previously shown.

**Example:** Graph  $3x + 4y = 12$

The first step is to solve our equation for y.

$$3x + 4y = 12$$

$$3x + 4y - 3x = 12 - 3x$$

First subtract “3x” from both sides

$$4y = -3x + 12$$

$$\frac{4y}{4} = \frac{-3x}{4} + \frac{12}{4}$$

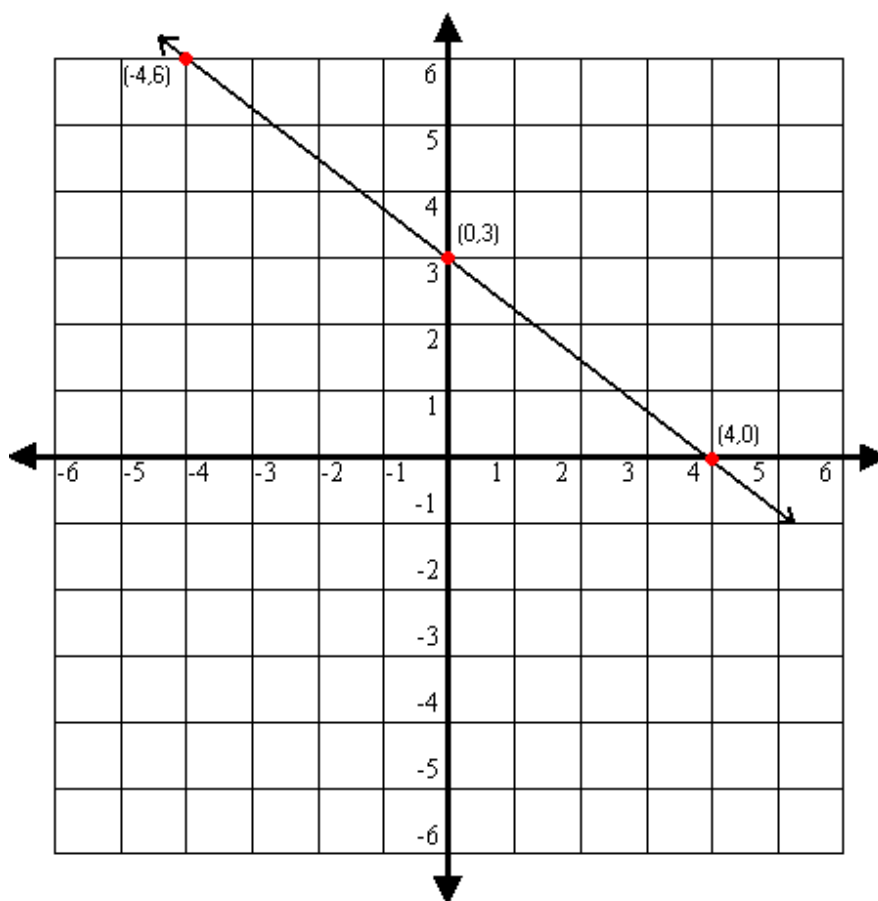
Next divide each term by “4”

$$y = -\frac{3}{4}x + 3$$

Now we can find points for the graph by choosing values for  $x$  and finding the corresponding  $y$  value.

$x$	$y = -\frac{3}{4}x + 3$	$y$	$(x,y)$
-4	$y = -\frac{3}{4}(-4) + 3$	6	$(-4, 6)$
0	$y = -\frac{3}{4}(0) + 3$	3	$(0, 3)$
4	$y = -\frac{3}{4}(4) + 3$	0	$(4, 0)$

Now we can plot our points on the graph and draw our line.



The graph of a linear equation with one of the variables (x or y) missing is either a horizontal line or a vertical line.

If “x” is missing, our equation will be a horizontal line in the form of  $y = b$ . This is because no matter what value “x” is the value for “y” will always be “b”.

If “y” is missing, our equation will be a vertical line in the form of  $x = a$ . This is because no matter what value “y” is the value for “x” will always be “a”.