

3.1: The Rectangular Coordinate System

9/23/2015

Note Title

Prereading assignment:

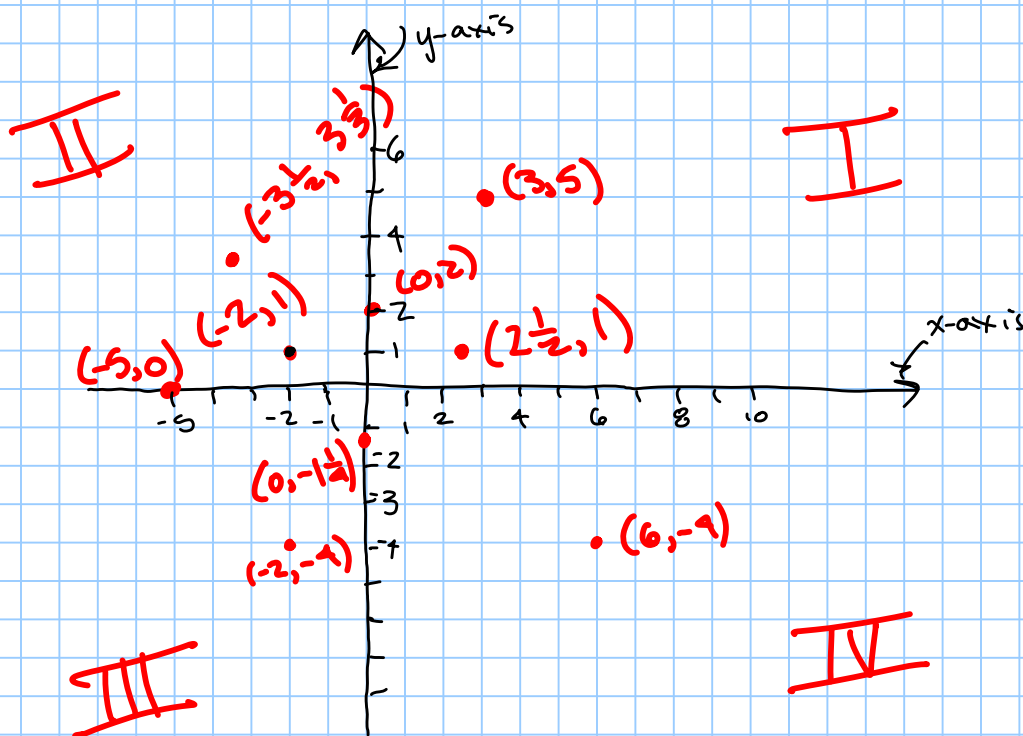
Example:

write as mixed numbers:

- | | |
|---------------------------------|-----------|
| $(-\frac{1}{2}, \frac{10}{3})$ | |
| $(2\frac{1}{2}, 1)$ | |
| $(0, -\frac{5}{4})$ | |
| $(-3\frac{1}{2}, 3\frac{1}{3})$ | $(-2, 1)$ |
| $(2\frac{1}{2}, 1)$ | $(3, 5)$ |
| $(0, -\frac{1}{4})$ | $(0, 2)$ |
| | $(-5, 0)$ |

A couple more points:

- $(-2, -4)$
 $(6, -4)$



3.2: Solutions and graphs of linear equations (in 2 variables)

A linear equation in 2 variables can be written as $Ax + By = C$, where A, B, C are numbers.

A solution to a linear equation is an ordered pair that makes the equation true (when the values in the ordered pair are substituted into the equation for x and y .)

Example: Is $(4, 6)$ a solution to $3x - 2y = 1$?

$$3x - 2y = 1$$

$$x = 4, y = 6 \Rightarrow 3(4) - 2(6) = 1$$
$$12 - 12 = 1$$
$$0 = 1 \text{ False!}$$

No, $(4, 6)$ is not a solution.

Is $(5, 7)$ a solution to $3x - 2y = 1$?

$$x = 5, y = 7 \Rightarrow 3(5) - 2(7) = 1$$
$$15 - 14 = 1$$
$$1 = 1 \text{ True}$$

Yes, $(5, 7)$ is a solution.

See next page

New example

Can you think of any other solutions to $3x - 5y = 1$? (2)

Try $(3, 4)$: $x=3, y=4 \Rightarrow 3(3) - 5(4) = 1$
 $9 - 20 = 1$ Nope

Try $(7, 4)$: $x=7, y=4 \Rightarrow 3(7) - 5(4) = 1$
 $21 - 20 = 1$
 $1 = 1$ True. Yes, $(7, 4)$ is a sol'n.

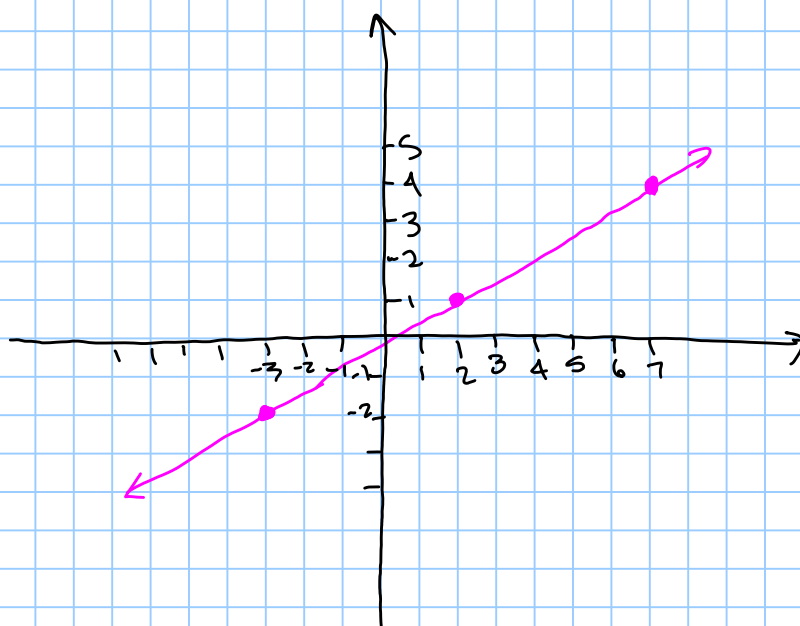
Try $(-7, -4)$: $x=-7, y=-4 \Rightarrow 3(-7) - 5(-4) = 1$
 $-21 + 20 = 1$
 $-1 = 1$ False

$(-3, -2)$: $x=-3, y=-2 \Rightarrow 3(-3) - 5(-2) = 1$
 $-9 + 10 = 1$
 $1 = 1$ ✓ True

Solutions so far: ~~$(5, 7)$~~
 $(7, 4)$
 $(-3, -2)$
 $(2, 1)$

$3x - 5y = 1$

$x=2, y=1 \Rightarrow 3(2) - 5(1) = 1$
 $6 - 5 = 1$
 $1 = 1$ True



The graph of an equation is the set of all ordered pairs that make the eqn. true. (the solution set)

To graph an equation means to draw an accurate picture of the solution set.

Example: Graph the line $-3x + 4y = -4$.

Choose a value for x or y , then solve for the other.

$-3x + 4y = -4$

$x=2$

$-3(2) + 4y = -4$
 $-6 + 4y = -4$
 $4y = -4 + 6$
 $4y = 2$
 $\frac{4y}{4} = \frac{2}{4}$
 $y = \frac{1}{2}$

$(2, \frac{1}{2})$

$x=4 \Rightarrow -3(4) + 4y = -4$
 $-12 + 4y = -4$
 $+12$
 $4y = 8$
 $\frac{4y}{4} = \frac{8}{4}$
 $y = 2$

$(4, 2)$

see next page

Previous example cont'd

(3)

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

$$y = 5 \Rightarrow$$

$$-3x + 4(5) = -4$$

$$-3x + 20 = -4$$

$$-3x = -24$$

$$\frac{-3x}{-3} = \frac{-24}{-3}$$

$$x = 8$$

(8, 5)

$$y = -3 \Rightarrow -3x + 4(-3) = -4$$

$$-3x - 12 = -4$$

$$-3x = 8$$

$$\frac{-3x}{-3} = \frac{8}{-3}$$

$$x = -\frac{8}{3}$$

$(-2\frac{2}{3}, -3)$

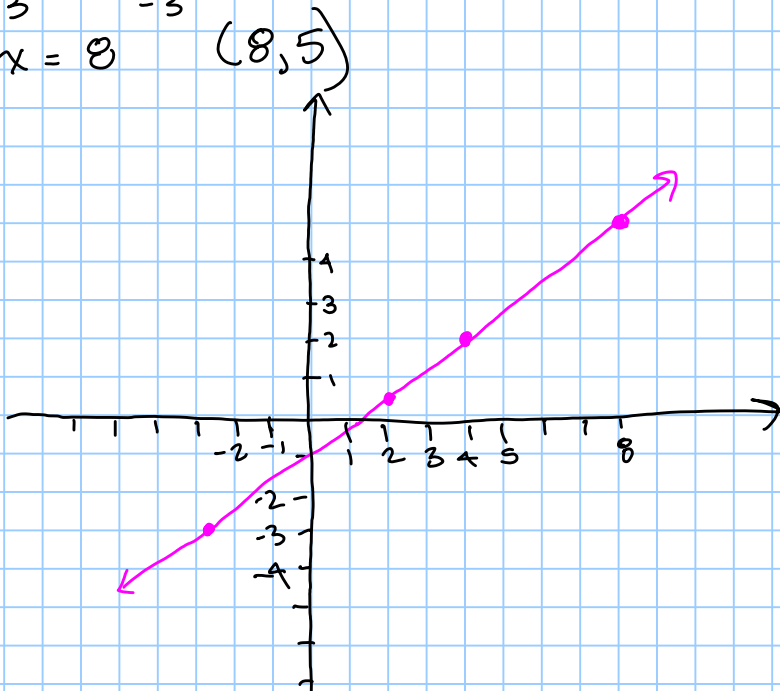
solutions:

(8, 5)

$(-2\frac{2}{3}, -3)$

$(2, \frac{1}{2})$

(4, 2)



Ex: Graph the equation $3x + y = -2$ by first solving for y .

$$3x + y = -2$$

$$y = -3x - 2$$

x	y = -3x - 2
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$$y = -3(0) - 2 = 0 - 2 = -2$$

$$y = -3(1) - 2 = -3 - 2 = -5$$

$$y = -3(2) - 2 = -6 - 2 = -8$$

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

$$y = -3(-2) - 2 = 6 - 2 = 4$$

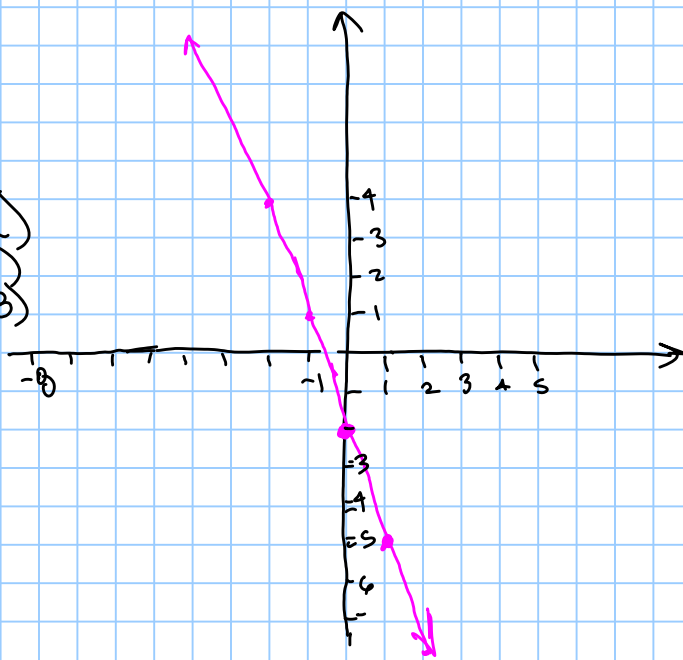
(0, -2)

(1, -5)

(2, -8)

(-1, 1)

(-2, 4)



Ex: Solve for y: $2x + 3y = 6$

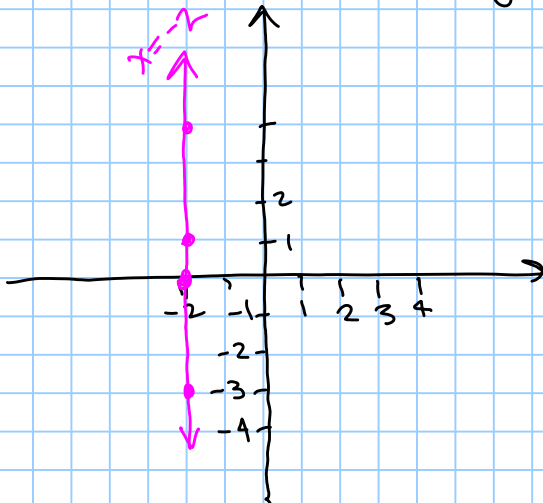
$$3y = -2x + 6$$

$$\frac{3y}{3} = \frac{-2x + 6}{3}$$

$$y = -\frac{2}{3}x + 2$$

x	$y = -\frac{2}{3}x + 2$
1	$y = -\frac{2}{3}(1) + 2 = -\frac{2}{3} + 2 = -\frac{2}{3} + \frac{6}{3} = \frac{4}{3} = 1\frac{1}{3}$
3	$y = -\frac{2}{3}(3) + 2 = -2 + 2 = 0$
6	$y = -\frac{2}{3}(6) + 2 = -4 + 2 = -2$
-3	$y = -\frac{2}{3}(-3) + 2 = 2 + 2 = 4$
-6	
-9	

Ex: Graph the equation $x = -2$.



$$(-2, -3)$$

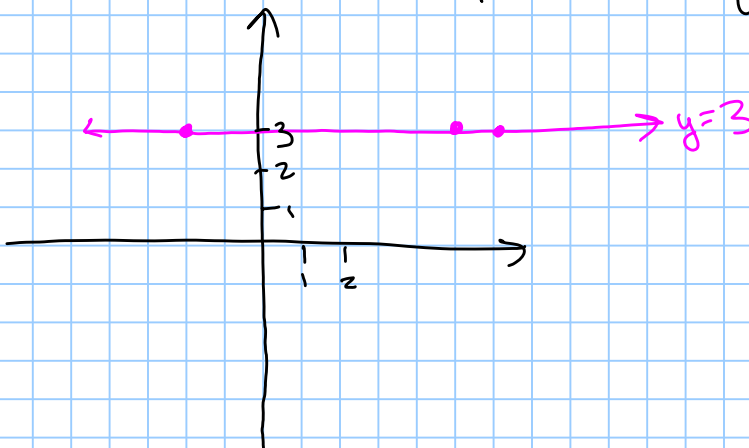
$$(-2, 1)$$

$$(-2, 4)$$

$$(-2, 0)$$

$$(-2, 3\frac{3}{5})$$

Ex: Graph the equation $y = 3$.



$$(-2, 3)$$

$$(6, 3)$$

$$(5, 3)$$

$$(85, 3)$$

Section 3.3: Graphing Linear Equations using intercepts.

(5)

x-intercept: x-coordinate of pt where graph intersects x-axis

y-intercept: y-coordinate of pt where graph intersects y-axis.

To find the x-intercept, set $y=0$ and solve for x .

To find the y-intercept, set $x=0$ and solve for y .

Ex: Graph $2x - 3y = 12$ using intercepts:

Find x-intercept: Set $y=0$: $2x - 3(0) = 12$

$$2x = 12$$

$$x = 6$$

$(6, 0)$

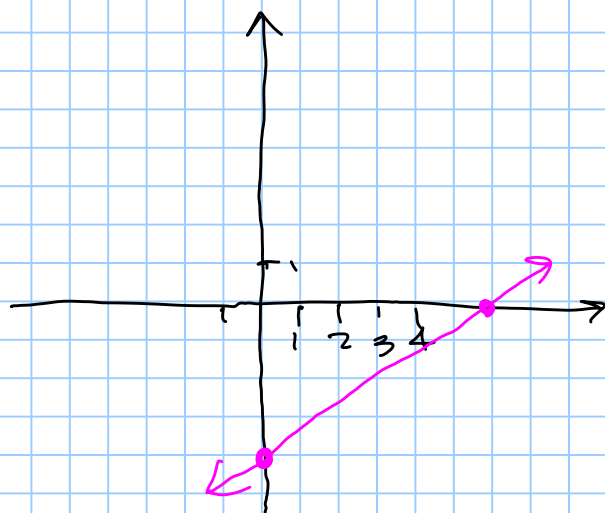
Find y-intercept: Set $x=0$: $2(0) - 3y = 12$

$$0 - 3y = 12$$

$$-3y = 12$$

$$y = -4$$

$(0, -4)$



x-intercept: 6

or $(6, 0)$

y-intercept: -4

or $(0, -4)$