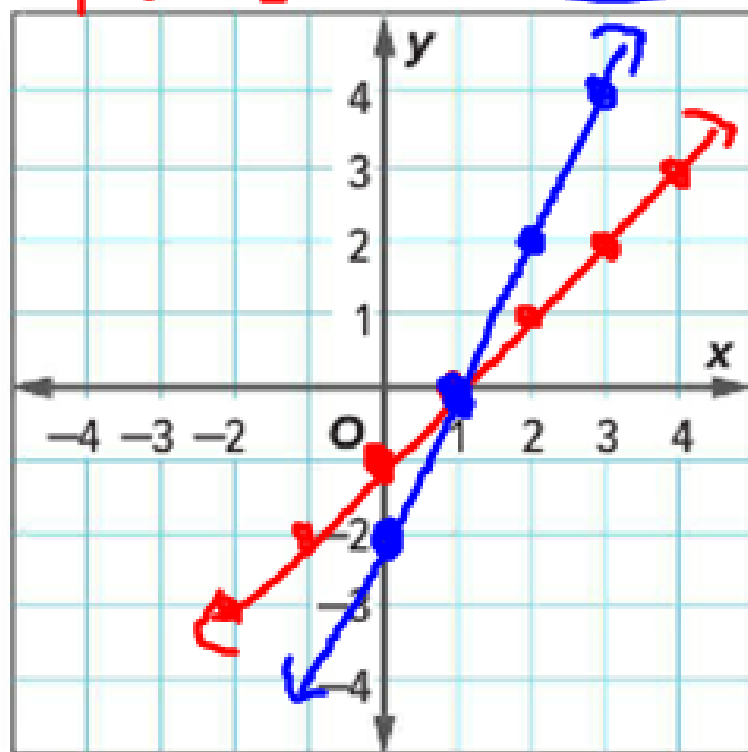Grab a ruler from the front table and open your book to p. 234 and Warm Up on Got It a and b. Have your homework out ready to check.

Classwork - Solving Systems of Equations

$y = mx + b$

$m \rightarrow$ slope

$b \rightarrow y\text{-int}$

Got it? Do these problems to find out.

$m = 1$ $b = -1$

a. $y = x - 1$ $(1, 0)$

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

b. $y = 4x + 0$ $m = \frac{4}{1}$

$y = x + 3$ $(1, 4)$
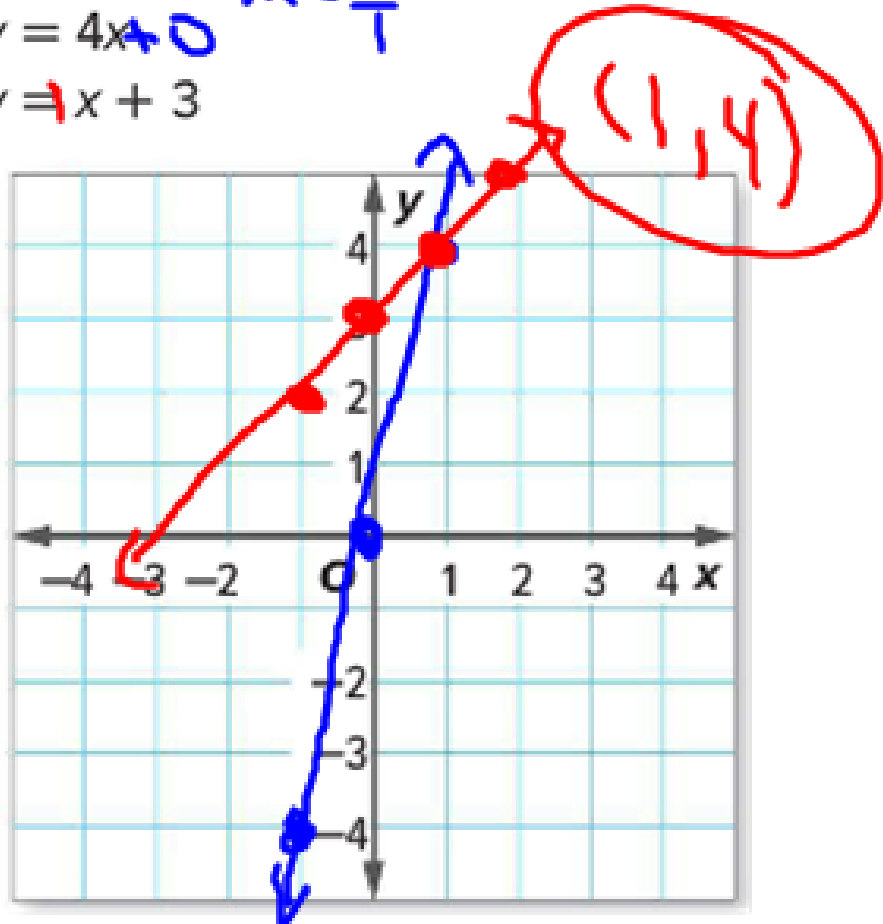
1) Write the following equations that are in standard form in slope intercept form.

$y = mx + b$

A) $4x + 8y = 32$

$-4x -4x$

$$\frac{8y = -4x + 32}{8}$$

$8y = 32 - 4x$

$$\frac{8y}{8} = \frac{32 - 4x}{8}$$

$y = -\frac{1}{2}x + 4$

B) $15x - 3y = 21$

$-15x -15x$

$$\frac{-3y = -15x + 21}{-3} \quad \frac{}{-3}$$
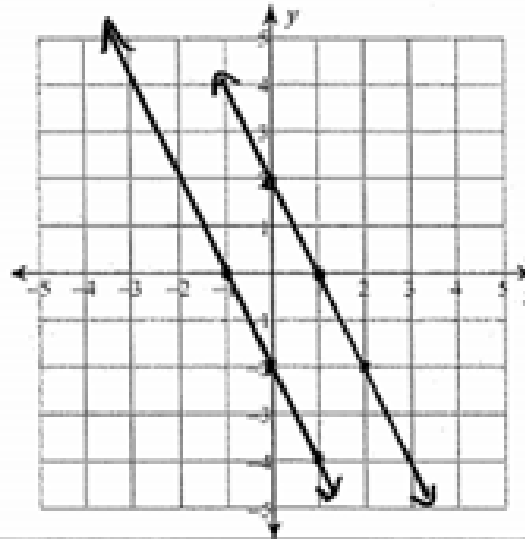
$y = 5x - 7$

Graph the following equations to find where the two lines intersect. State the number of solutions and the solution in ordered pair form if there is 1 solution.
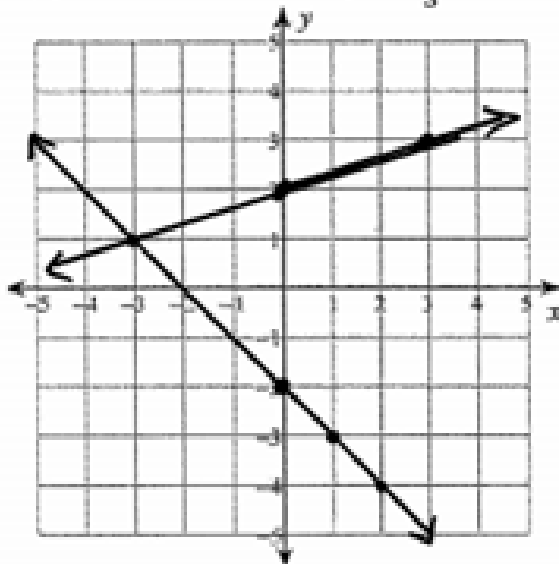
2) $y = 3x - 4$ and $y = -\frac{1}{2}x + 3$
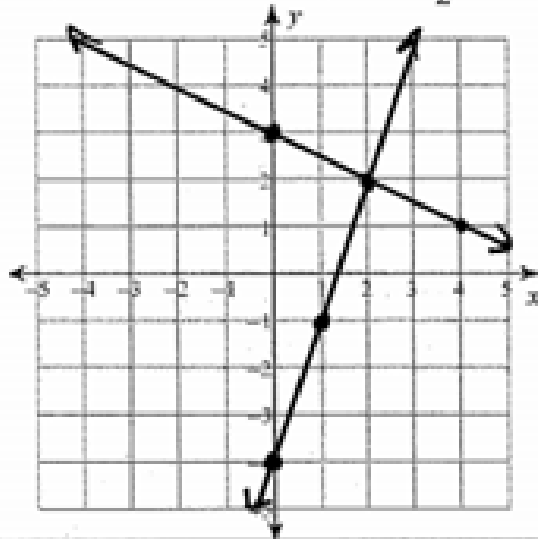
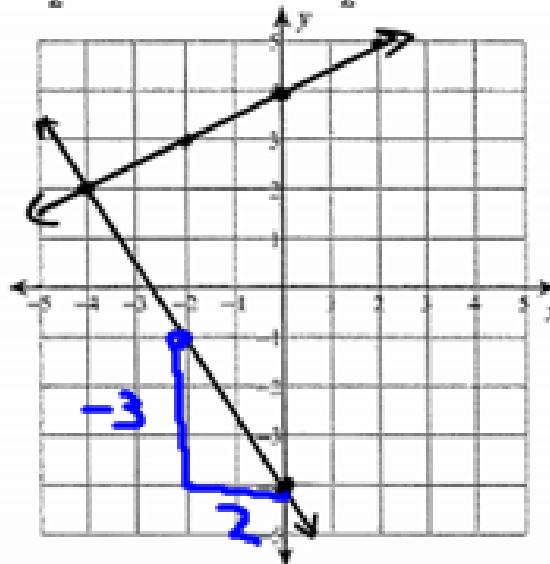of Solution(s): ___1___ Solution: (2, 2)

3) $y = -2x + 2$ and $y = -2x - 2$

No Solutions

# of Solution(s): ___0___ Solution: (,   )

4) $y = -x - 2$ and $y = \frac{1}{3}x + 2$

# of Solution(s): ___1___   Solution: $(-3, 1)$

5) $y = -\frac{3}{2}x - 4$ and $y = \frac{1}{2}x + 4$

# of Solution(s): ___1___   Solution: $(-4, 2)$

$m = \frac{-3}{2}$ down 3 right 2

or

$m = \frac{3}{-2}$ up 3 left 2

6) $y = -4x + 4$ and $y = -\frac{1}{2}x - 3$
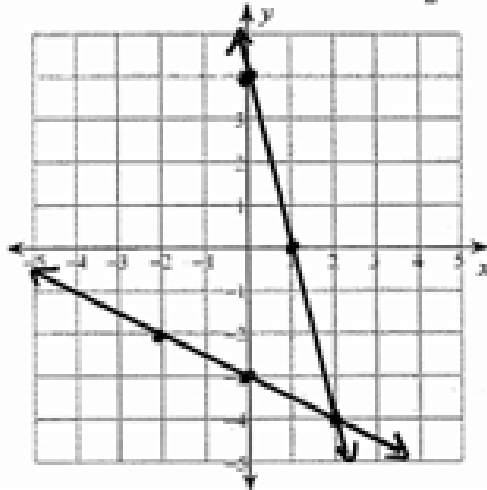
# of Solution(s): ___1___   Solution: $(2, -4)$

7) $y = -2x + 1$ and $4x + 2y = 2$
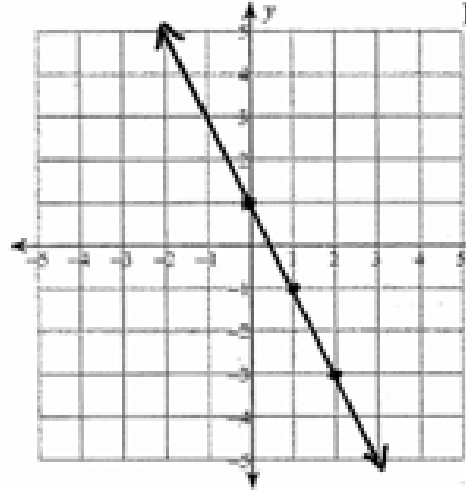
Rewrite in slope intercept form

$4x + 2y = 2$
$-4x \quad\quad -4x$
$\dfrac{2y}{2} = \dfrac{-4x + 2}{2}$

$y = -2x + 1$

# of Solution(s): ___∞___   Solution: (All Real Numbers)

Solve the following equations. Possible answers include (No Solutions, Infinite Solutions, or $x = $ #)

8) $8x - 16 = 4(2x - 4)$

$8x - 16 = 8x - 16$

$\underline{-8x \qquad -8x}$

$-16 = -16$

Infinite Solutions

9) $-2x + 9 = -2x + 5$

$\underline{+2x \qquad\quad +2x}$

$9 \neq 5$

No Solution

10) $-9x + 3 = -3(x - 5)$

$-9x + 3 = -3x + 15$

$\underline{+3x \qquad\quad +3x}$

$-6x + 3 = 15$

$\underline{-3 \qquad -3}$

$\dfrac{-6x}{-6} = \dfrac{12}{-6}$

$x = -2$

One Solution

Systems of Equations

Two or more equations with the same set of variables are called a **system of equations**. For example, $y = 4x$ and $y = 4x + 2$ together are a system of equations.

You can estimate the solution of a system of equations by graphing the equations on the same coordinate plane. The ordered pair for the point of intersection of the graphs is the solution of the system because the point of intersection simultaneously satisfies both equations.

Example

Tutor

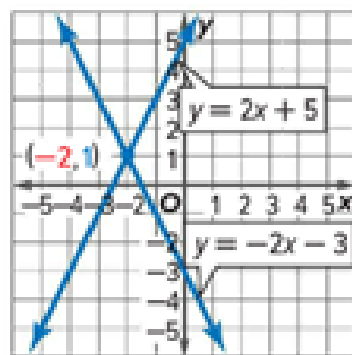1. **Solve the system $y = -2x - 3$ and $y = 2x + 5$ by graphing.**

Graph each equation on the same coordinate plane.

The graphs appear to intersect at $(-2, 1)$.

Check this estimate by replacing x with -2 and y with 1.

Check

$y = -2x - 3$	$y = 2x + 5$
$1 \stackrel{?}{=} -2(-2) - 3$	$1 \stackrel{?}{=} 2(-2) + 5$
$1 = 1 \checkmark$	$1 = 1 \checkmark$

The solution of the system is $(-2, 1)$.

a. $y = x - 1$
$\quad\ y = 2x - 2$

b. $y = 4x$
$\quad\ y = x + 3$

Gregory's Motorsports has motorcycles (two wheels) and ATVs (four wheels) in stock. The store has a total of 45 vehicles, that, together, have 130 wheels.

[handwritten] $x = \text{# of ATUs}$

$y = \text{# of motorcycles}$

2. Write a system of equations that represents the situation.

Let y represent the motorcycles and x represent the ATVs.

$y + x = 45$ — The number of motorcycles and ATVs is 45.

$2y + 4x = 130$ — The number of wheels equals 130.

[handwritten] $\overset{x\ \ y}{(20, 25)}$

3. Solve the system of equations. Interpret the solution.

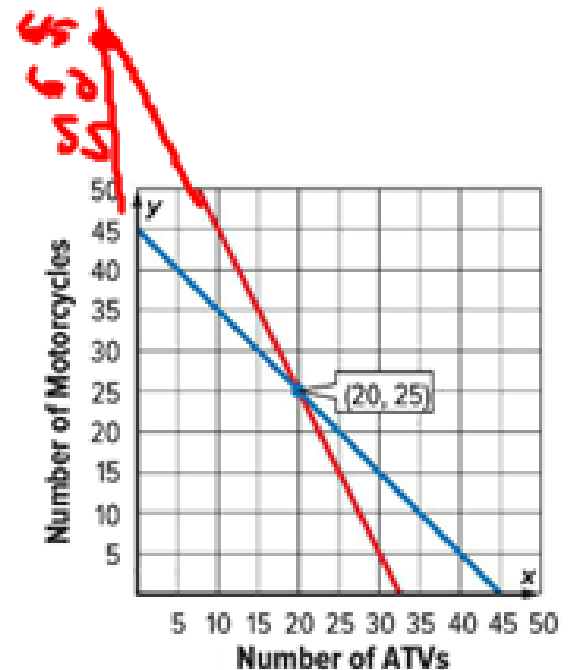Write each equation in slope-intercept form.

$x + y = 45$
$\quad -x \quad -x$
$\quad y = -x + 45$

[handwritten] $m = -1$

$b = 45$

$2y + 4x = 130$
$\quad -4x \quad -4x$
$2y = -4x + 130$
$y = -2x + 65$

[handwritten] $m = -2$

$b = 65$

Graph both equations on the same coordinate plane. The equations intersect at $(20, 25)$.

The solution is $(20, 25)$. This means that the store has 20 ATVs and 25 motorcycles.
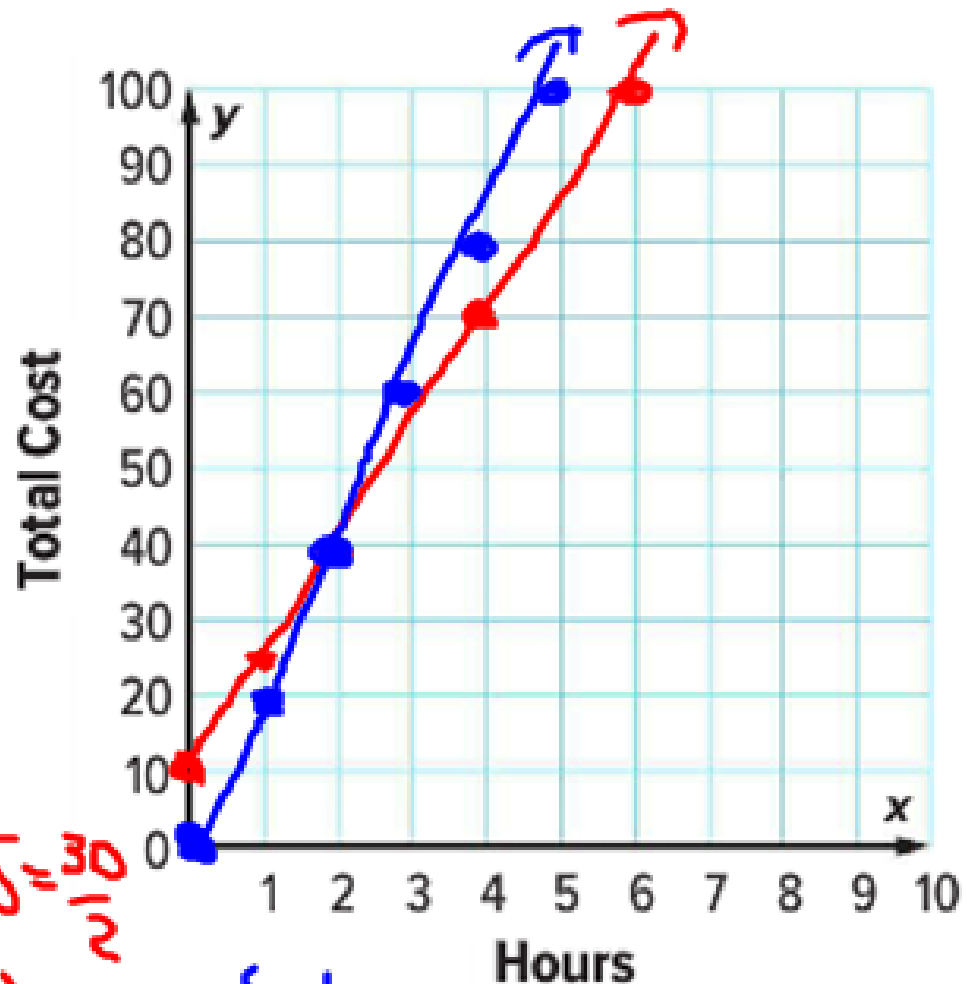

Check

$x + y = 45$

$20 + 25 \overset{?}{=} 45$

$45 = 45$ ✓

$2y + 4x = 130$

$2(25) + 4(20) \overset{?}{=} 130$

$130 = 130$ ✓

Got it? Do this problem to find out.

Eq 1

c. Creative Crafts gives scrapbooking lessons for $15 per hour plus a $10 supply charge. Scrapbooks Incorporated Eq 2 gives lessons for $20 per hour with no additional charges. Write and solve a system of equations that represents the situation. Interpret the solution.

$x = $ hours

$y = $ Total Cost

Eq 1: $y = 15x + 10$ $m = 15 = \frac{30}{2}$ $b = 10$

Eq 2: $y = 20x$ $m = 20$ $b = 0$

Solution = $(2, 40)$
At 2 hours they both cost $40