

DEFINITIONS:

- A **system of equations** is a set of two or more equations with the same variables.
- A **solution** to a **system of equations** is a set of values for the variables that solve all the equations simultaneously (at the same time).
- The intersection of two graphed lines is the solution to a system of equations.

SOLVING BY GRAPHING STEPS:

- **STEP 1:** Solve both equations for y. In other words, put the equation in slope-intercept form, $y = mx + b$.
- **STEP 2:** Using the slope and y-intercept graph both lines on the same coordinate plane.
- **STEP 3:** Find the intersecting point if it occurs. This ordered pair is the solution to the system.

EXAMPLE 1:

$$\begin{aligned} 3x + y &= 9 & \textcircled{1} \\ y &= -x - 1 & \textcircled{2} \end{aligned}$$

Step 1: Solve by equations for y.

Which equation do we need to rewrite? _____

Step 2: Using the slope and y-intercept graph both lines on the coordinate plane.

Step 3: Find the point of intersection if it occurs.

$(5, -6)$

EXAMPLE 2:

$$\begin{aligned} y &= -2x + 3 & \textcircled{1} \\ -x + 2y &= -4 & \textcircled{2} \end{aligned}$$

Step 1: Solve by equations for y.

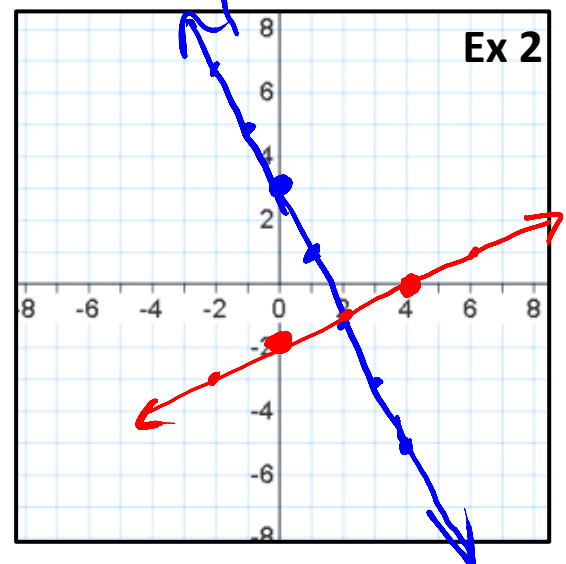
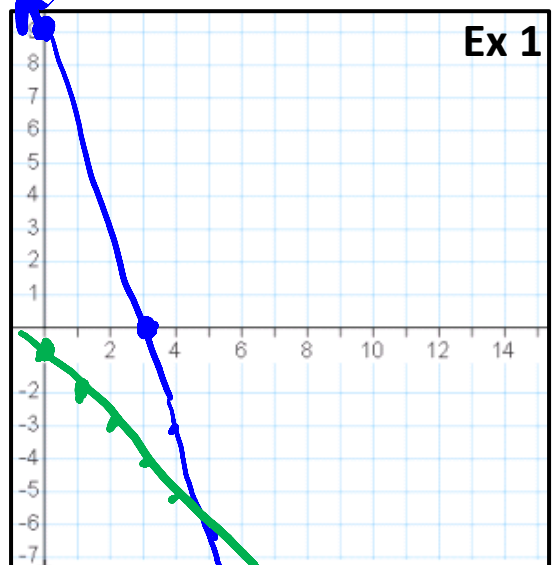
Which equation do we need to rewrite? _____

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

Step 2: Using the slope and y-intercept graph both lines on the coordinate plane.

Step 3: Find the point of intersection if it occurs.

$(2, -1)$



EXAMPLE 3:

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

$$6y - 3x = 6$$

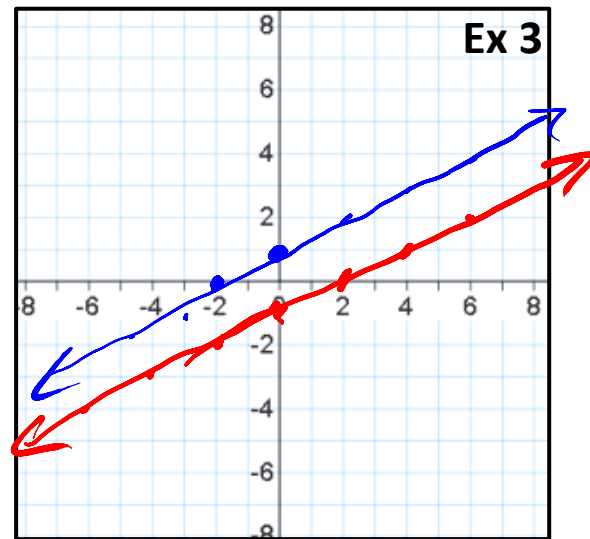
Step 1: Solve by equations for y.

Which equation do we need to rewrite? _____

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

Step 2: Using the slope and y-intercept graph both lines on the coordinate plane.

Step 3: Find the point of intersection if it occurs. no solution

**EXAMPLE 4:**

$$y = \frac{2}{3}x - 4$$

$$2x - 3y = 12$$

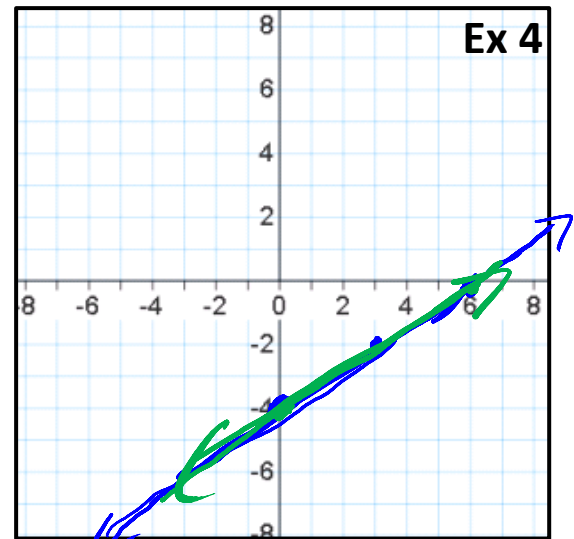
Step 1: Solve by equations for y.

Which equation do we need to rewrite? _____

$$y = \frac{2}{3}x - 4$$

Step 2: Using the slope and y-intercept graph both lines on the coordinate plane.

Step 3: Find the point of intersection if it occurs. infinite solutions

**WORD PROBLEM:**

Suppose you and your friends form a band. You want to record a demo. Studio

A rents for \$100 plus \$50 per hour. Studio B rents for \$50 plus \$75 per hour.

- a. Write an equation to represent the cost of each studio.

$C = \text{cost}$

Studio A: $50t + 100 = C$

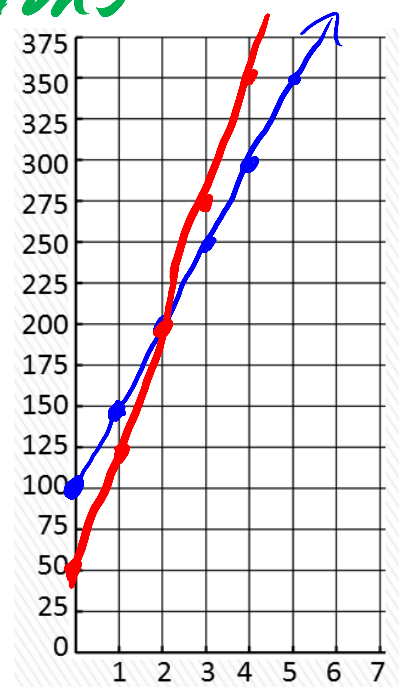
Studio B: $75t + 50 = C$

- b. Solve the system by graphing.

Solution: $(2, 200)$

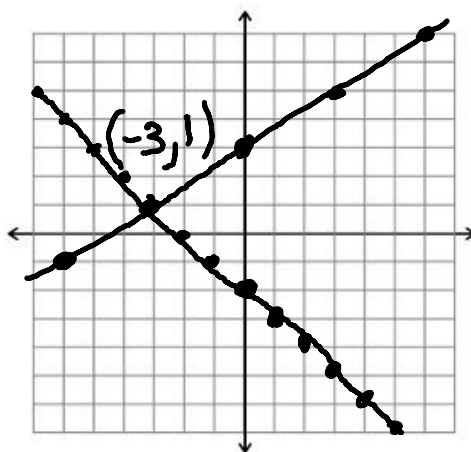
- c. Explain what the solution of the system means in terms of renting a

studio. For 2 hours the studios will cost the same



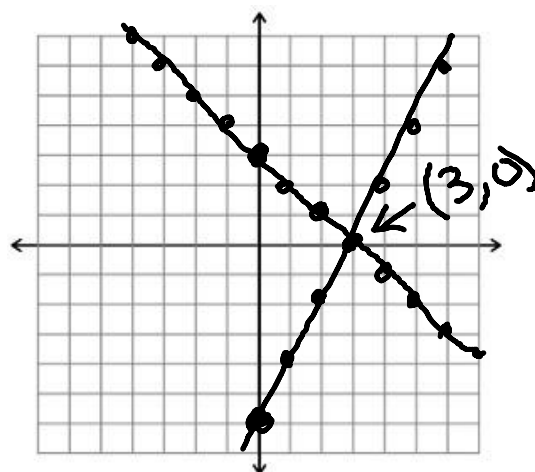
Solving Systems of Linear Equations by Graphing Practice

1. $y = -\frac{1}{3}x - 2$ $\leftarrow$ y-int $m = -\frac{1}{3}$
 $y = \frac{2}{3}x + 3$ $\leftarrow$ y-int $m = \frac{2}{3}$



Solution: $(-3, 1)$

2. $y = -\frac{1}{2}x - 3$ $\leftarrow$ y-int $m = -\frac{1}{2}$
 $y = \frac{2}{3}x - 6$ $\leftarrow$ y-int $m = \frac{2}{3}$

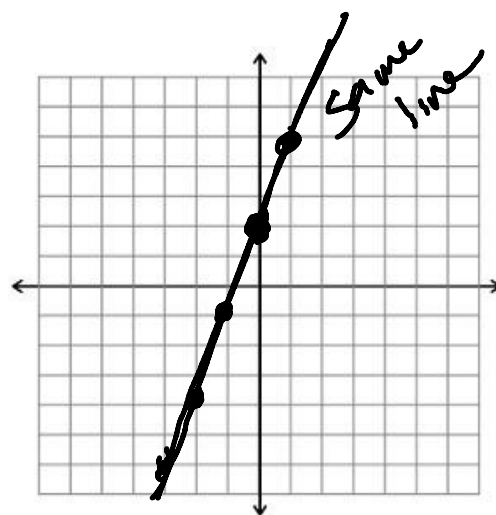


Solution: $(3, 0)$

3. $y = 3x + 2$ $\leftarrow$ slope $\downarrow$ y-int
 $6x - 2y = -4$ $\leftarrow$ y-int $y = 3x + 2$

$$\begin{array}{r} 6x - 2y = -4 \\ -6x \quad -6x \\ \hline -2y = -6x - 4 \\ \frac{-2y}{-2} = \frac{-6x - 4}{-2} \quad \frac{-2}{-2} \\ y = 3x + 2 \end{array}$$

$y = 3x + 2$



Solution: infinitely many solutions

4. $2x - 3y = 9$

$$y = \frac{4}{3}x - 5$$

$\leftarrow y\text{-int}$

slope

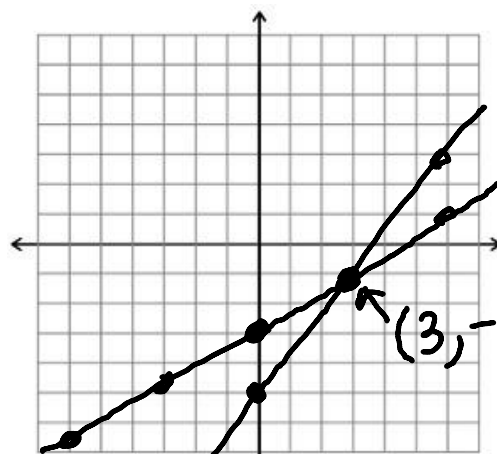
$$2x - 3y = 9$$

$$-2x \quad -2x$$

$$\frac{-3y}{-3} = \frac{-2x + 9}{-3}$$

$$(3, -1)$$

Solution: _____



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

$\leftarrow$ slope

5. $-2x + 4y = 12$

$$x - 2y = 6$$

$$-2x + 4y = 12$$

$$+2x \quad +2x$$

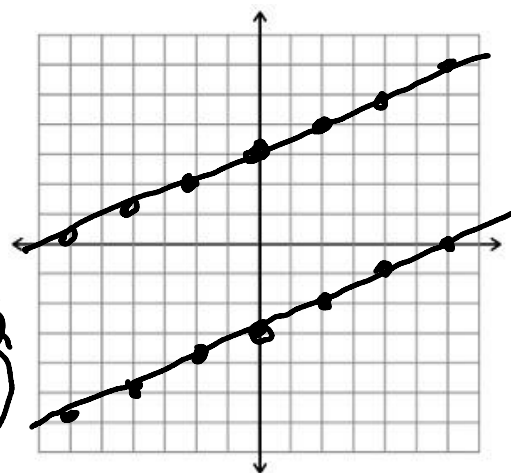
$$\frac{4y}{4} = \frac{2x + 12}{4}$$

$$y = \frac{1}{2}x + 3$$

$$x - 2y = 6$$

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

$$y = \frac{1}{2}x - 3$$



Solution: _____

No solution