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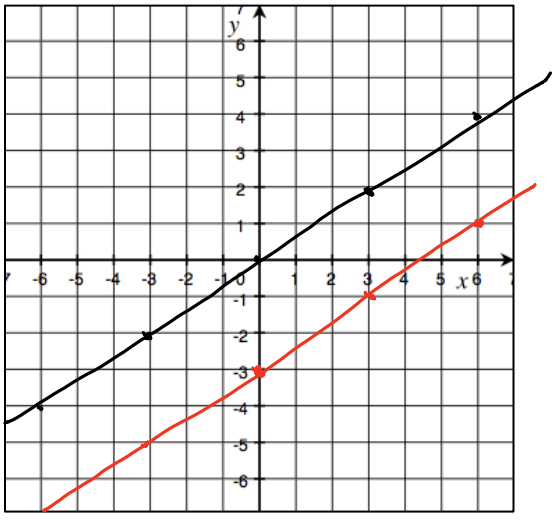
LEARNING OBJECTIVE: We will look at systems of equations that have no solutions and systems that have infinitely many solutions. (G8M4L23)

CONCEPT DEVELOPMENT:

Graph the following system of equations in the space provided:

$$\begin{cases} y = \frac{2}{3}x \\ y = \frac{4}{6}x - 3 \end{cases}$$



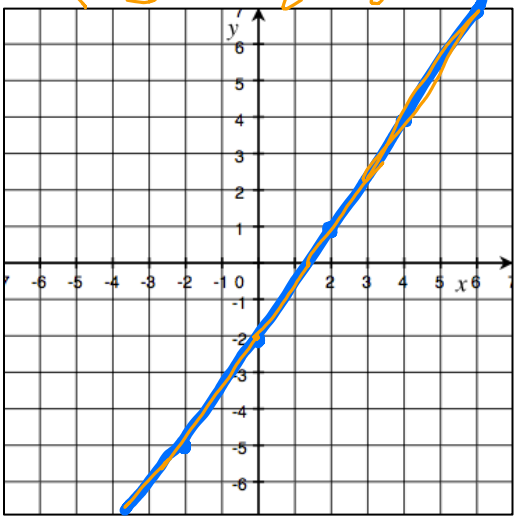
- Lines are parallel
- Same slope
- No common points
- Lines have different y-intercepts.

PARALLEL LINES HAVE NO POINTS OF INTERSECTION THE SYSTEM OF EQNS HAS NO SOLUTION!!

Graph the following system of equations in the space provided:

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

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



- Two lines are the same
- Same y-intercept
- Same slope

LINES THAT HAVE THE SAME SLOPE & SAME Y-INTERCEPT FORM A SYSTEM WITH INFINITELY MANY SOLUTIONS

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Guided Practice:

Steps for Determining the Number of Solutions to a System of Linear Equations

1. Identify the slope of each linear equation.
2. If the slopes are the same, identify the y-intercept.

3a. If the y-intercepts are the same, the two equations represent the same line and there are INFINITELY MANY SOLUTIONS.

3b. If the y-intercepts are different, the two equations are distinct parallel lines and have NO SOLUTION.

3c. If the slopes are different, there will be ONE UNIQUE SOLUTION.

For each problem below, determine if the system has infinitely many solutions, no solution, or one unique solution.

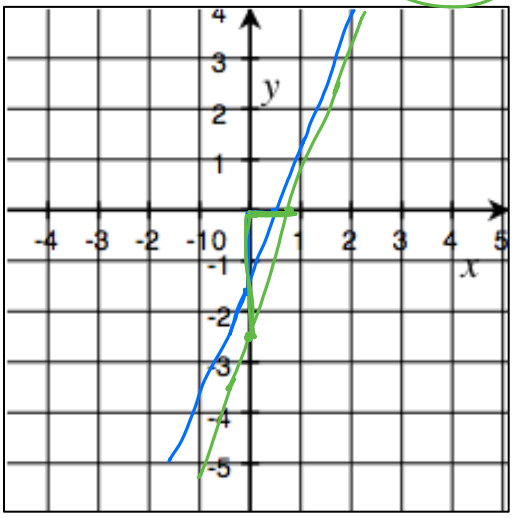
$\begin{cases} 6x - 2y = 5 \\ 4x - 3y = 5 \end{cases}$

$-2y = 5$, $y = -2\frac{1}{2}$, $6x = 5$, $x = \frac{5}{6}$

$8x - 3y = 5$, $-3y = 5$, $y = -\frac{5}{3}$, $4y = 5$, $x = \frac{5}{8}$

1. Convert to Slope-intercept

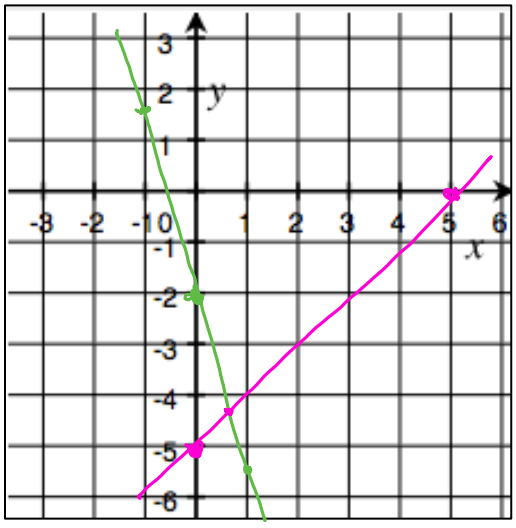
2. Slope $= -\frac{a}{b}$ → is slope the same?



# of Solutions? 1

$\begin{cases} 7x + 2y = -4 \\ x - y = 5 \end{cases}$

$m = -\frac{7}{2}$, $b = -2$, $y = -\frac{7}{2}x - 2$



# of Solutions? 1

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$\begin{cases} 12x + 3y = -2 \\ 4x + y = 7 \end{cases}$

$-\frac{a}{b} = \frac{-12}{3} = -4$

$\frac{3y}{3} = \frac{-2 - 12x}{3}$

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

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

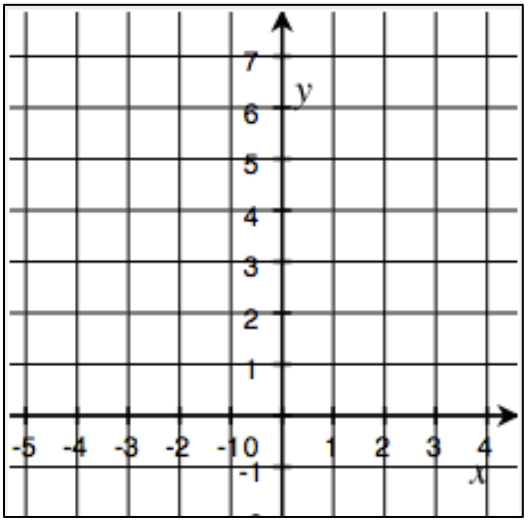
$-\frac{4}{1} = -4$ m

$y = 7$ b

$y = -4x + 7$

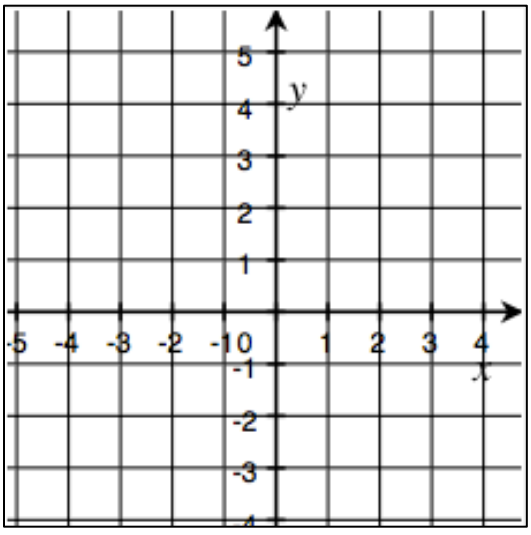
SAME SLOPE ☺

DIFF. Y-INT. ☹



# of Solutions? 0

$\begin{cases} -2x + 8y = 14 \\ x = 4y + 1 \end{cases}$



# of Solutions?

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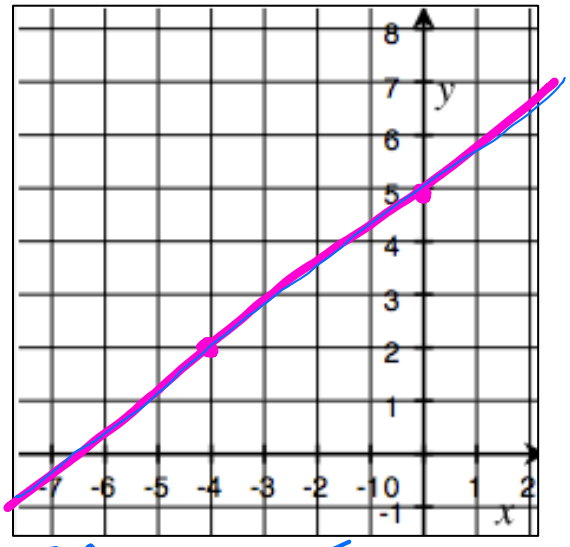
$$\begin{cases} 5y = \frac{15}{4}x + 25 \\ y = \frac{3}{4}x + 5 \end{cases}$$

$5y = \frac{15}{4}x + 25$

$\frac{5}{5}$

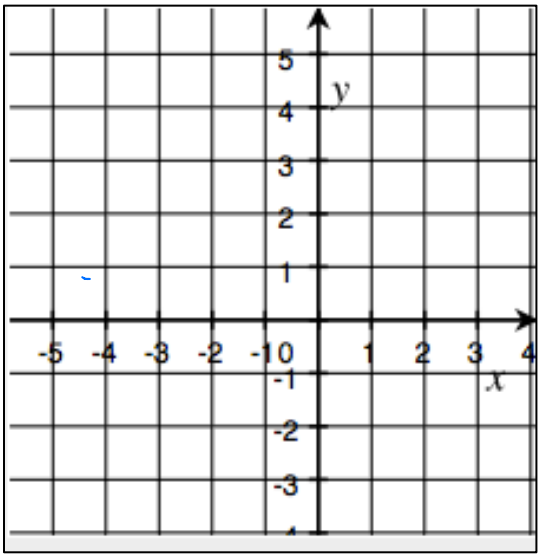
$y = \frac{3}{4}x + 5$



SAME SLOPE
SAME Y INT.

# of Solutions? INFINITELY MANY

$$\begin{cases} 9x + 6y = 3 \\ 3x + 2y = 1 \end{cases}$$



# of Solutions?

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Independent Practice:

For each problem below, determine if the system has infinitely many solutions, no solution, or one unique solution.

$\begin{cases} y = x - 3 \\ 2x - 2y = 6 \end{cases}$	$\begin{cases} y = -\frac{3}{2}x + 4 \\ 3x + 2y = 8 \end{cases}$
$\begin{cases} y = \frac{3}{5}x - 3 \\ y = \frac{3}{5}x + 1 \end{cases}$	$\begin{cases} y = \frac{3}{2}x \\ 3x - 2y = -5 \end{cases}$

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$\begin{cases} 3y = 5x - 15 \\ 3y = 13x - 2 \end{cases}$	$\begin{cases} 3x - 5y = 0 \\ y = \frac{3}{5}x \end{cases}$
$\begin{cases} 10x + 4y = -23 \\ y = -\frac{5}{2}x + 23 \end{cases}$	$\begin{cases} y = x + 1 \\ x - y = 1 \end{cases}$

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Activating Prior Knowledge:

We can identify the number of solutions in equations in one variable.

$5x + 45 = 2(x + 18) + 3x$	$3x - 4 = 4x - (x + 4)$
$5x+45 = 2x+36+3x$ $5x+45 = 5x+36$ $\emptyset$ Solutions	$3x-4 = 4x-x-4$ $3x-4 = 3x-4$ Infinitely many solutions

1 solution - Different coefficients

$\emptyset$ - Same coefficients, different constants

Infinitely many - Same / Same

Closure:

Write a system of equations that has no solutions and be ready to explain why you know it has no solutions.

$\begin{cases} y=3x+2 \\ y=3x+1 \end{cases}$ $\begin{cases} y=x \\ y=x+2 \end{cases}$

$\begin{cases} y=2.5x+4 \\ 5x-2y=-2 \end{cases}$ $\begin{cases} y=\frac{1}{2}x+25 \\ y=\frac{1}{2}x-7 \end{cases}$

Teacher Notes:

Lesson 26 from ENY Mod 4, Grade 8. And first half of Lesson 27…

HW: Khan Graphing Systems of Equations (goes with lesson 50, but it's fine to assign this now)
Khan: Graphing Systems with one, zero, or infinite solutions