Solving Linear Systems by Graphing

- Chapter 7 Section 1

Systems of Equations

- Given 2 equations, find the point (x, y) that is a solution to BOTH equations.
- There can be one solution, no solutions, or infinitely many solutions.
- There are three methods: graphing, substitution, and elimination

Systems of Equations

- Example:
  - Is (3, 5) a solution of

$$2x - y = 1$$
$$-3x + 4y = 12$$

x y

No

$2(3) - 5 = 1$

$6 - 5 = 1$ ✓

$-3(3) + 4(5) = 12$

$-9 + 20 = 12$ X

  - What is the solution?

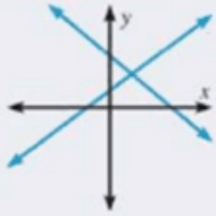
Number of solutions

EXACTLY ONE SOLUTION

The graph of the system is a pair of lines that intersect in one point.

The lines have different slopes.

The system has exactly one solution.



INFINITELY MANY SOLUTIONS

The graph of the system is a pair of identical lines.

The lines have the same slope and the same *y*-intercept.

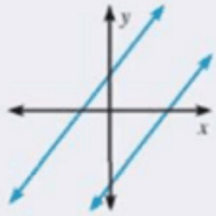
The system has infinitely many solutions.

NO SOLUTION

The graph of the system is a pair of parallel lines, which do not intersect.

The lines have the same slope and different *y*-intercepts.

The system has no solution.



Solving Using Graphing

- Steps:
  - 1. Put both equations in slope-intercept form
    - Solve for y. $y = mx + b$
  - 2. Graph both equations on the same coordinate plane
  - 3. Find the point where they intersect

Examples:

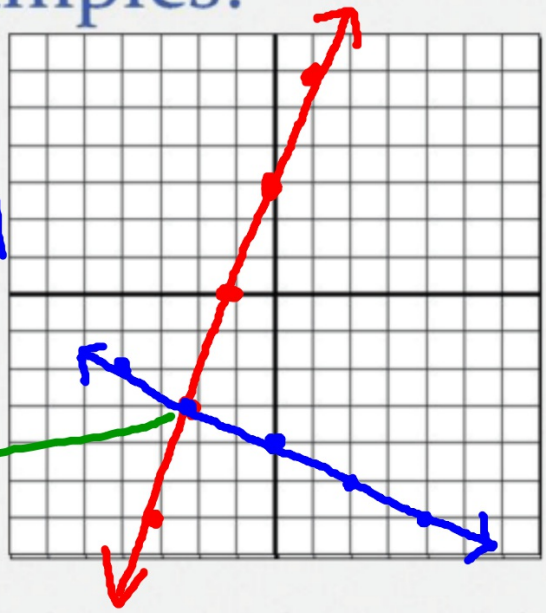
1. $y = 3x + 3$

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

$m = -\frac{1}{2}, b = -4$

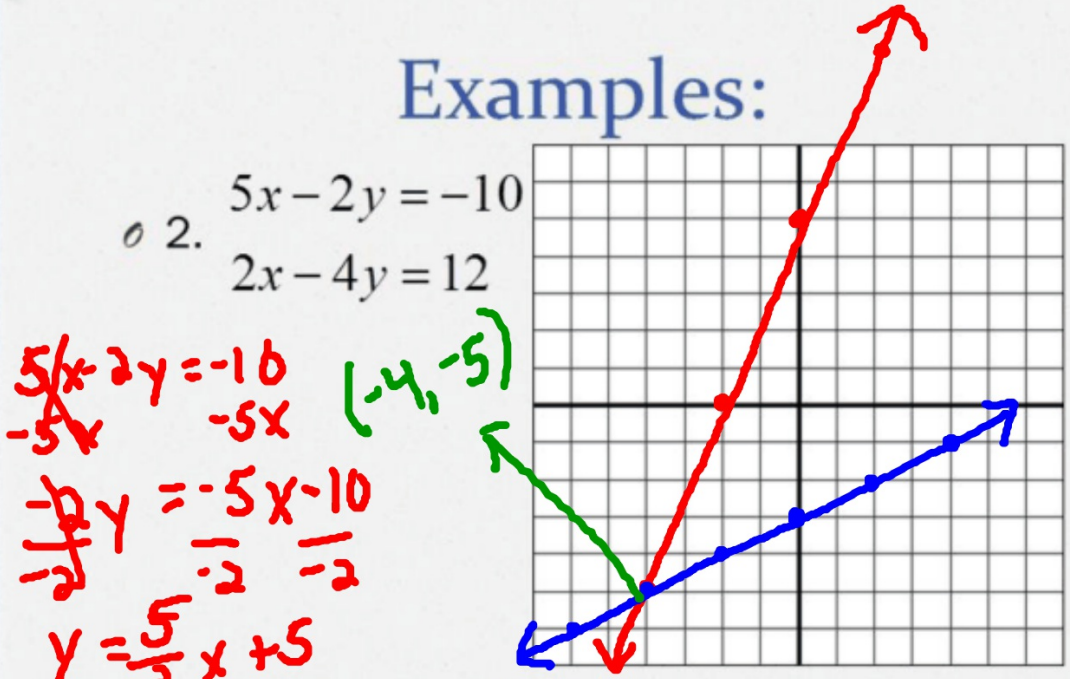
$m = \frac{3}{1}$ $b = 3$

$(-2, -3)$



Examples:

- 2. $5x - 2y = -10$
  $2x - 4y = 12$



$5x - 2y = -10$
$-5x \quad -5x$
$\frac{-2y}{-2} = \frac{-5x}{-2} - \frac{10}{-2}$
$y = \frac{5}{2}x + 5$
$m = 5/2, b = 5$

$(-4, -5)$

$2x - 4y = 12$
$-2x \quad -2x$
$\frac{-4y}{-4} = \frac{-2x}{-4} + \frac{12}{-4}$
$y = \frac{1}{2}x - 3$
$m = \frac{1}{2}, b = -3$

Examples:

- 3. $x + 2y = 4$

$x + 2y = 1$

$-x \quad -x$

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

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

$m = -\frac{1}{2}$

$b = 2$

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

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

$m = -\frac{1}{2}$

$b = \frac{1}{2}$

No Solution

Examples:

4. $2x - y = 1$
   $-4x + 2y = -2$

$+4x \quad +4x$

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

$y = 2x - 1$

$m = 2$

$b = -1$

$2x - y = 1$

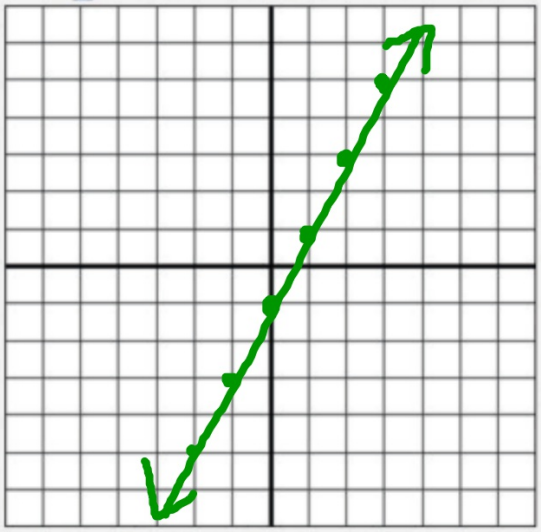
$-2x \quad -2x$

$-y = -2x + 1$

$y = 2x - 1$

$m = 2$

$b = -1$



Infinite # of solutions

CLASSWORK

$2x-3y=9$

$-3y=-2x+9$

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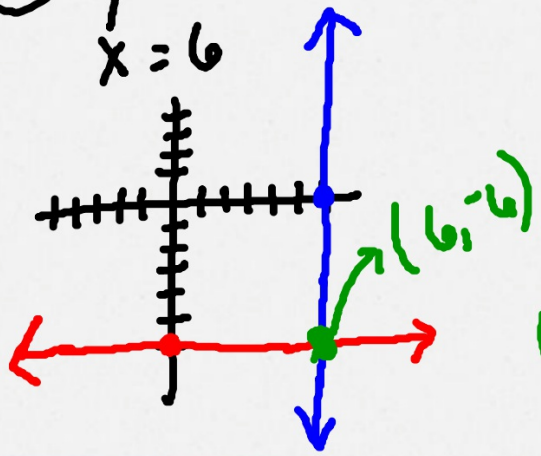
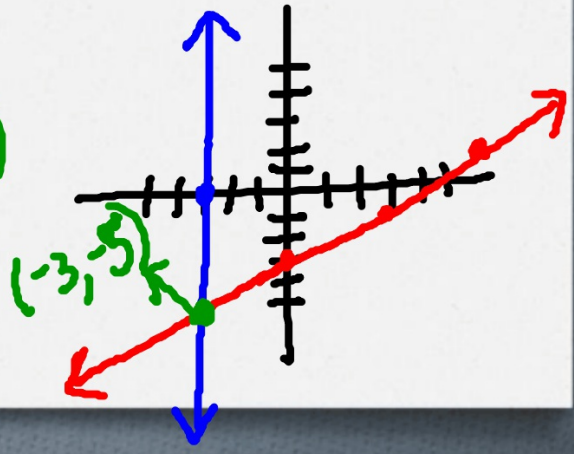
(21) $y=-6$

$x=6$



(23) $y=\frac{2}{3}x-3$

$x=-3$



Homework

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