Warm up

Use the graph to determine whether each system has *no* solution, *one* solution, or *many* solutions.

1. $y = -x - 3$
   $y = x - 1$
   one solution $(-1, -2)$

2. $2x + 2y = -6$
   $y = -x - 3$
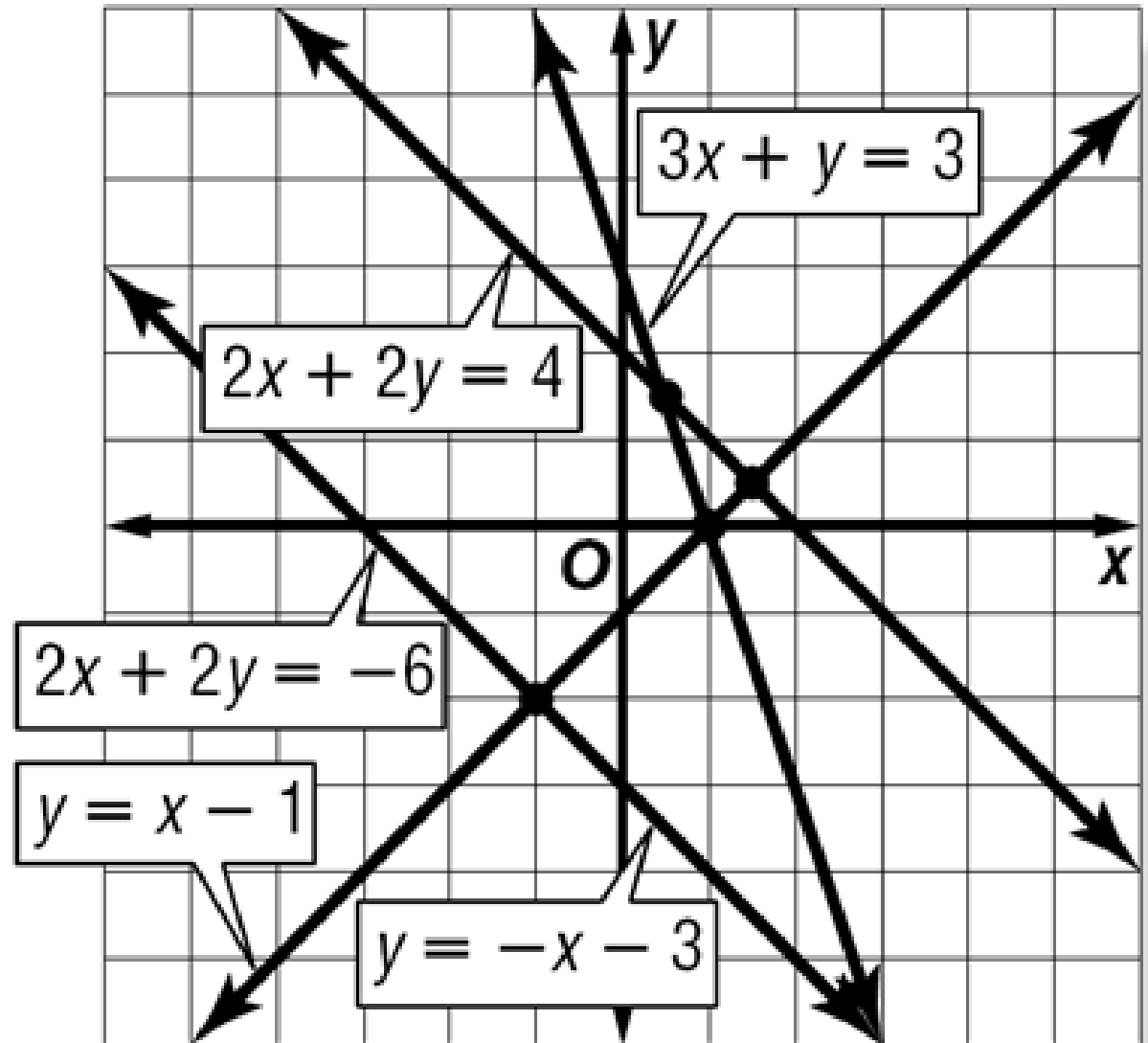 ∞ solution

3. $y = -x - 3$
   $2x + 2y = 4$
   no solution

4. $2x + 2y = -6$
   $3x + y = 3$
   one solution $(3, -6)$

$3x + y = 3$

$2x + 2y = 4$

$2x + 2y = -6$

$y = x - 1$

$y = -x - 3$

Find the value of the function

$$f(x) = 2x + 4$$

when x = 3

$$f(3) = 2(3) + 4$$
$$= 6 + 4$$
$$= 10$$

THERE ARE 3 KINDS OF PEOPLE IN THIS WORLD
THOSE WHO ARE GOOD AT MATH,
AND THOSE WHO AREN'T

Solving Systems by Substitution

Objectives for Today:

You will be able to:

* Create and solve a system of equations and understand what it represents.

* Solve a systems of equations algebraically by the method of substitution.

Substitution Method

* used to find a solution to a system

* a variable must be solved for or isolated in
     one of the equations

How would you solve for x?
x + 2y = -21 when y = 5

$x + 2(5) = -21$

$x + 10 = -21$
$-10 \quad -10$

$x = -31$

Now what if.... Instead: $y = 3(-3) = -9$

$(-3, -9)$

$y = 3x$

$x + 2y = -21$

$x + 2(3x) = -21$

$-3 + 2y = -21$

$x + 6x = -21$

$+3 \qquad\qquad +3$

$\dfrac{7x}{7} = \dfrac{-21}{7}$

$\dfrac{2y}{2} = \dfrac{-18}{2}$

$x = -3$

$y = -9$

How can we solve this?

Steps you can use to solve a system using substitution:

1. Pick an equation and solve for a variable.

2. Substitute the result into the other equation.

3. Solve the equation.

4. Substitute the answer into the first equation.

What do you think (no solution) and infinitely many solutions will look like when solving by substitution?

Not true

$y = 2x + 1$

$y = 2x + 1$

$2x + 1 = 2x + 1$

$-2x - 1 \quad -2x - 1$

$0 = 0$ ✓

∞ Solutions

$-5 = 2$ ✗

$x = \boxed{-2y}$

$x + y = 1$

$x = -2(-1)$

$x = 2$

$-2y + y = 1$

$\dfrac{-y}{-1} = \dfrac{1}{-1}$

$y = -1$

$(2, -1)$

$y = 3x$

$4x + 2y = 30$

$y = 3(3)$

$Y = 9$

$4x + 2(3x) = 30$

$4x + 6x = 30$

$\dfrac{10x}{10} = \dfrac{30}{10}$

$x = 3$

$(3, 9)$

Now what can we do??

$x + 5(-1) = -3$

$x + 5y = -3$

$3x - 2y = 8$

$x + 5y = -3$
$-5y \quad -5y$
$x = -5y - 3$

$3(-5y - 3) - 2y = 8$

$-15y - 9 - 2y = 8$
$\quad +9 \qquad +9$

$-15y - 2y = 17$

$\dfrac{-17y}{-17} = \dfrac{17}{-17}$

$\boxed{(y = -1)}$

$(2, -1)$

$3x - 2(-1) = 8$

$3x + 2 = 8$
$\quad -2 \quad -2$

$\dfrac{3x}{3} = \dfrac{6}{3}$

$(x = 2)$

Now you try!

$x + 2y = 13$

$3x - 5y = 6$

$x + 2y = 13$
$-2y \quad -2y$
$x = -2y + 13$

$3(-2y+13) - 5y = 6$

$-6y + 39 - 5y = 6$
$\quad -39 \qquad -39$

$-6y - 5y = -33$

$\dfrac{-11y}{-11} = \dfrac{-33}{-11}$

$\boxed{y = 3}$

$3x - 5(3) = 6$

$3x - 15 = 6$
$\quad +15 \quad +15$

$\dfrac{3x}{3} = \dfrac{21}{3}$

$x = 7$

$(7, 3)$

$y = -3x + 4$

$y = 3x - 2$

$-3x + 4 = 3x - 2$

$\qquad +2 \qquad\qquad +2$

$-3x + 6 = 3x$

$+3x \qquad\qquad +3x$

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

$1 = x$

$y = 3(1) - 2$

$= 3 - 2$

$y = 1$

$(1, 1)$

$$x + 4y = 8$$
$$2x - 5y = 29$$

$$2(-4y+8)-5y=29$$
$$-8y+16-5y=29$$
$$-16-16$$
$$-8y-5y=13$$
$$\frac{-13y}{-13}=\frac{13}{-13}$$
$$\boxed{y=-1}$$

$$x+4y=8$$
$$-4y \quad -4y$$
$$x=-4y+8$$

$$x+4(-1)=8$$
$$x-4=8$$
$$+4 \quad +4$$
$$\boxed{x=12}$$

$$-4y+8+4y=8$$

$x + 5y = 8 \longrightarrow x = -5y + 8$

$2x + 10y = 29$

$2(-5y+8)+10y=29$

$-10y+16+10y=29$
$-16 -16$

$0y=13$

$0 \neq 13$ no solution

$x + 4y = 12$

$x = -4y + 12$

$-4y + 12 + 4y = 12$
$\quad -12 \qquad\qquad -12$

$0 = 0$

∞ solutions

or

many solutions

Objectives for Today:

You now know how to:

* Create and solve a system of equations and understand what it represents.

* Solve a systems of equations algebraically by the method of substitution.

GREAT JOB!!!!!

Homework/Classwork!!!

Solving Systems by Substitution Worksheet