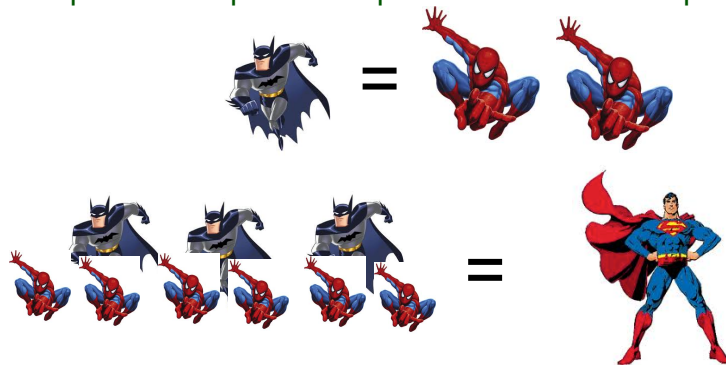# December 12th

Unit: Systems

Quiz on Friday

Lesson 5.4: Solving Systems Algebraically with Substitution
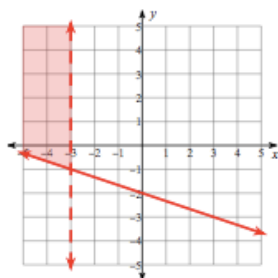
Get Ready:

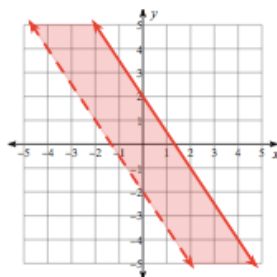How can we represent Superman's powers in terms of Spiderman's??

HW 5.3

answer the question and explain your answer mathematically!

HW Review

1) $y \geq -\dfrac{1}{3}x - 2$

   $x < -3$

2) $y > -\dfrac{3}{2}x - 2$

   $y \leq -\dfrac{3}{2}x + 2$

Solve each system by graphing.

3) $y = -7x - 4$
   $y = -x + 2$

   $(-1, 3)$
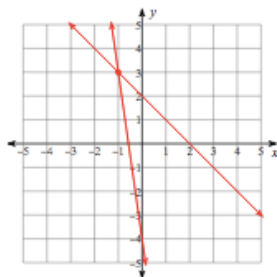
4) $y = \dfrac{1}{2}x + 1$

   $y = \dfrac{7}{4}x - 4$
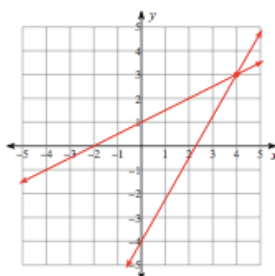
   $(4, 3)$

Use a graphing calculator (or an online graphing calculator) to find the solutions of these systems:

5) $2x - y = -19$
   $x - 2y = -14$

   $(-8, 3)$

6) $x - 11y = -154$
   $17x - 11y = 22$

   $(11, 15)$

HW Review

7) $-14 + 2a = 2(3a - 5)$

$-14 + 2a = 6a - 10$

$\underline{-2a \quad\quad -2a}$

$-14 = 4a - 10$

$\underline{+10 \quad\quad\quad +10}$

$-4 = 4a$

$\underline{+4 \quad\; \div 4}$

$-1 = a \qquad \boxed{a = -1}$

8) $-\dfrac{4}{3} = \dfrac{1}{2}\left(-\dfrac{5}{3} + r\right)$

$\dfrac{2}{2} \cdot -\dfrac{4}{3} = -\dfrac{5}{6} + \dfrac{r}{2}$

$-\dfrac{8}{6} = -\dfrac{5}{6} + \dfrac{r}{2}$

$\underline{+\dfrac{5}{6} \qquad +\dfrac{5}{6}}$

$-\dfrac{3}{6} = \dfrac{r}{2}$

$\left(-\dfrac{1}{2} = \dfrac{r}{2}\right)^{\times 2}$

$-1 = r$

$\boxed{r = -1}$

9) $-1 - \dfrac{7}{2}x = -\dfrac{11}{4}$

$-\dfrac{4}{4} - \dfrac{14}{4}x = -\dfrac{11}{4}$

$\underline{+\dfrac{4}{4} \qquad\qquad +\dfrac{4}{4}}$

$4 \cdot \left(\dfrac{-14}{4}x = -\dfrac{7}{4}\right) \cdot 4$

$-14x = -7$

$\underline{} \quad \underline{}$

$-14 \qquad -14 \qquad \rightarrow \boxed{x = \dfrac{1}{2}}$

10) $\dfrac{k + 5}{4k} = -\dfrac{3}{8}$

$8(k + 5) = -3(4k)$

$8k + 40 = -12k$

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

$40 = -20k$

$\underline{-20 \qquad -20}$

$\boxed{-2 = k}$

How we Solve Systems of Linear Equations:

1) **Graphically**

2) **Algebraically**

    – substitution

    – elimination

Solving a system using Substitution!

Using what you know is true about one variable
to replace the other variable.

For example, we replaced the Batman variable

.

Lonely Variable: the variable that is most by itself

y = 3x + 2	-3 + y = 3x	5a + 7b = 12
2x + 3y = 10	2x = -4y - 8	2a - 6b = 12

Example 1:

1) $2x + 3y = 6$

2) $2y = 6x + 4$

$$\frac{2y}{2} = \frac{6x}{2} + \frac{4}{2}$$

→ $y = 3x + 2$

$2x + 3(3x + 2) = 6$

$2x + 9x + 6 = 6$

$11x + 6 = 6$

$\quad -6 \quad -6$

$11x = 0$

$\frac{11x}{11} = \frac{0}{11}$

$x = 0$

$y = 3x + 2$

$y = 3(0) + 2$

$y = 2$

$\boxed{x = 0}$
$\boxed{y = 2}$

Steps to Solving Systems Using Substitution

1. Isolate the lonely variable if it isn't already alone.

2. Substitute your lonely variable equation into the OTHER equation in the system.

3. Simplify and solve for the remaining variable.

4. Plug your solution from step 3 into one of the original equations to solve for the lonely variable.

5. Write out the solutions to both variables.

How could we check our answer?

What does the solution mean?

How can we connect this to the graphical method?

Example 2:

$-a + \boxed{b} = -2$

$+a \qquad +a$

$b = a - 2$

$-3a + 2b = -6$

Example 3:

$3x - y = 5$

$2x + 3y = -4$

Example 4:

$2w + 2z = 4$

$-4w - 3z = 8$

Example 5:

$10m - 2n = 4$

$3m + 5n = 4$

Example 2:

$-a + \boxed{b} = -2 \rightarrow b = a-2$

$\underline{+a \qquad +a}$

$-3a + 2b = -6$

$-3a + 2(a-2) = -6$

$-3a + 2a - 4 = -6$

$\underline{+4 \qquad +4}$

$\underline{+a = -2}$

$a = 2$

$-a + b = -2$

$-2 + b = -2$

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

$b = 0$

$\boxed{\begin{array}{l} a = 2 \\ b = 0 \end{array}}$

Example 3:

$3x - y = 5$

$2x + 3y = -4$

$3x - y = 5$

$\underline{+y \qquad +y}$

$3x = 5 + y$

$\underline{-5 \qquad -5}$

$3x - 5 = y$

$2x + 3(3x-5) = -4$

$2x + 9x - 15 = -4$

$11x - 15 = -4$

$\underline{+15 \qquad +15}$

$\underline{11x = 11}$

$\boxed{\begin{array}{l} x = 1 \\ y = -2 \end{array}}$

Example 4:

$$2w + 2z = 4$$

$$-4w - 3z = 8$$

$\div 2$

$w + z = 2$

$-z \quad -z$

$w = 2 - z$

$-4(2-z) - 3z = 8$

$-8 + 4z - 3z = 8$

$+8 \qquad 8/8 \qquad +8$

$$z = 16$$

$$w = -14$$

Example 5:

$$10m - 2n = 4$$

$$3m + 5n = 4$$

$\div 2$

$5m - n = 2$

$+n \quad +n$

$5m = 2 + n$

$-2 \quad -2$

$n = 5m - 2$

$3m + 5(5m-2) = 4$

$3m + 25m - 10 = 4$

$28m \qquad +10 \quad +10$

$\dfrac{28m}{28} = \dfrac{14}{28}$
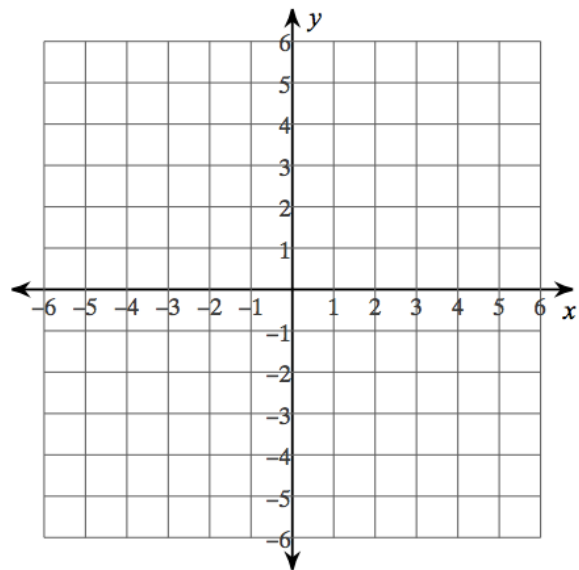
$m = \dfrac{1}{2}$

$$m = 1/2$$

$$n = 1/2$$

8. Solve the system below Algebraically AND Graphically!

$$-3y = 12$$
$$10x - 4y = -4$$

Recap

Key Points

Due Next Time:

HW 5.4

Next Class:

Solving Using Elimination!