NOTES: Section 3.1 – Solve Linear Systems by Graphing

Goals: #1 - I can solve a linear system using the graphing method and then check my solution algebraically.
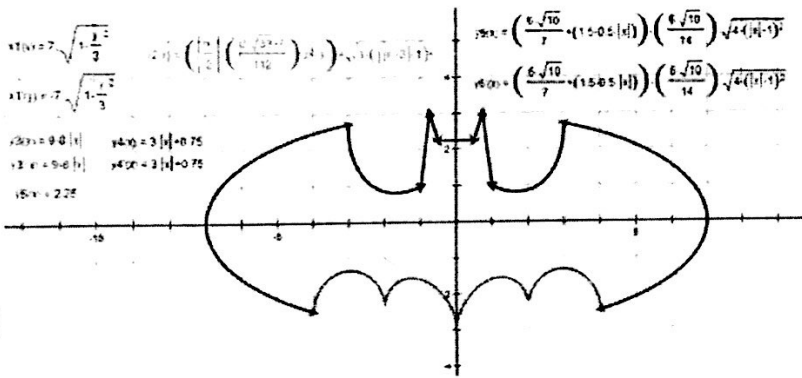
#2 - I can classify a system as consistent and independent, consistent and dependent, or inconsistent.

Homework: Lesson 3.1 Worksheet

Warm Up:

1. Identify the domain and range of the given relation. Then tell whether the relation is a function.

a. Domain: $[-7, 7]$

b. Range: $[-3, 3]$

c. Function?: NO

   Why? VLT

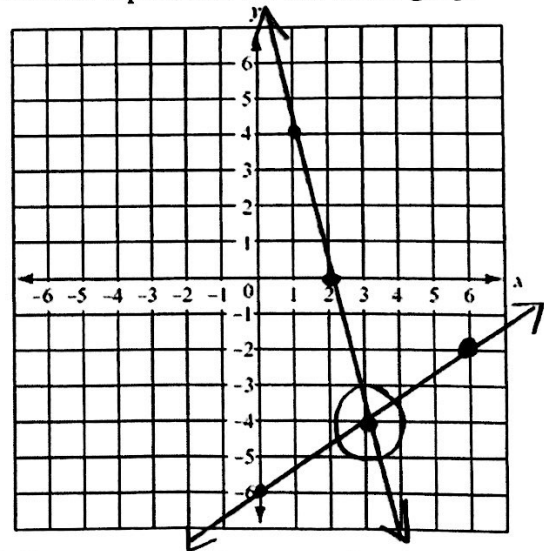**Exploration #1:** Work with a partner. Graph both linear equations on the same graph.

$4x + y = 8$

$y = -4x + 8$

$2x - 3y = 18$

$$\frac{-3y}{-3} = \frac{-2x + 18}{-3}$$

$$y = \frac{2}{3}x - 6$$

Circle where these lines intersect. Can you check if your answer is correct?

$(3, -4)$

$4(3) + (-4) \overset{?}{=} 8$

$12 - 4 \overset{?}{=} 8$

$8 = 8 ✓$

$2(3) - 3(-4) \overset{?}{=} 18$

$6 + 12 \overset{?}{=} 18$
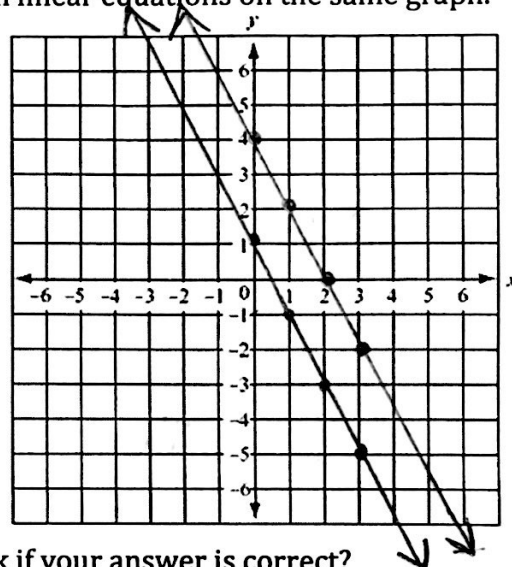
$18 = 18 ✓$

Notes:

A _____linear system_____, consists of two ___linear___ equations.

A ___solution___ of a system of linear equations, is a ___point___ (x, y) where the graphs of the equations in a system ___intersect___.

Exploration #2: Work with a partner. Graph both linear equations on the same graph.

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

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

Circle where these lines intersect. Can you check if your answer is correct?

Never intersect. Parallel lines.

Notes:

Lines that never intersect are called ___parallel lines.___

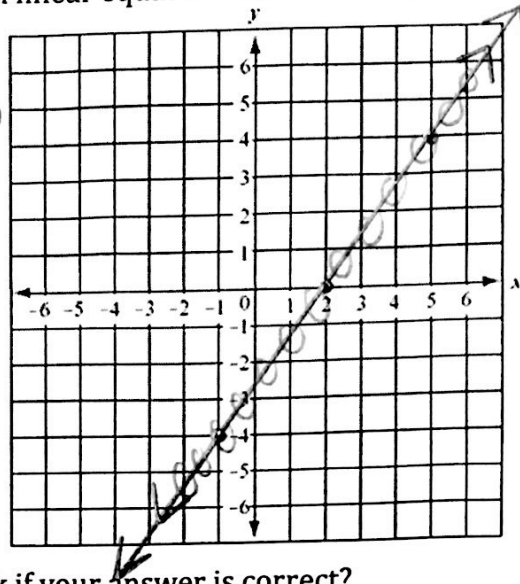Since the graphs of the system do ___NOT___ intersect, we have ___no solution___.

CHALLENGE: Could we have a system with a solution besides ONLY ONE SOLUTION, or NO SOLUTION? infinitely many

Exploration #3: Work with a partner. Graph both linear equations on the same graph.

$$4x - 3y = 8$$
$$-3y = -4x + 8$$
$$y = \frac{4}{3}x - \frac{8}{3}$$
$$8x - 6y = 16$$
$$-6y = -8x + 16$$
$$y = \frac{4}{3}x - \frac{8}{3}$$

x-int:
4x=8
x=2
(2,0)

Circle where these lines intersect. Can you check if your answer is correct?

intersect at every point.

Notes:

Lines that intersect at every point are __the same line__.

Since the graphs of the system intersect at __EVERY__ point, we have

__infinitely many solutions__.

Anytime there IS a solution to the linear system, we call the system __consistent__.

- A consistent system can be __independent__ if there is __ONE__ solution.
- A consistent system can be __dependent__ if there is __MANY__ solutions.

Anytime there IS NO solution to the linear system, we call the system __inconsistent__

ONE Solution

NO solution

INFINETLY MANY Solutions

consistent ; independent

inconsistent

consistent ; dependent
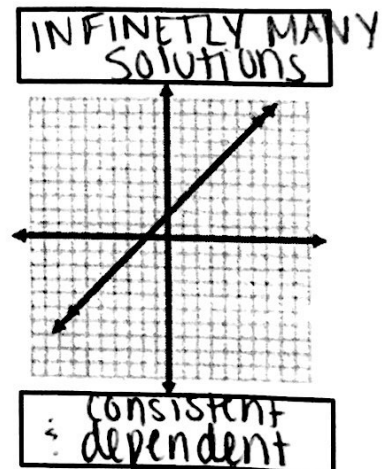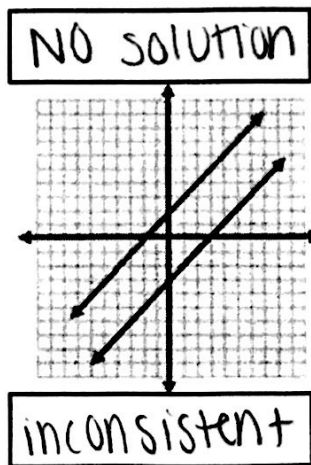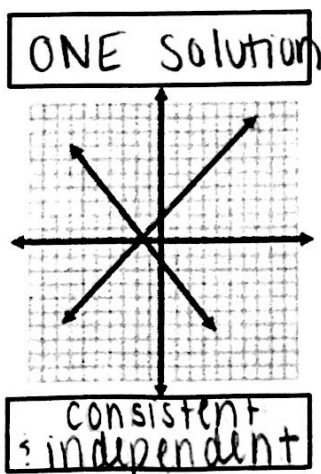
Example #1: You are going fridge shopping! The price of refrigerator A is $600, and the price of refrigerator B is $1200. The cost of electricity needed to operate your new refrigerators is $50 per year for refrigerator A and $40 per year for refrigerator B.

    a. Write a system of equations that models the cost of owning refrigerator A and the cost of owning refrigerator B. Be sure to define your variables.
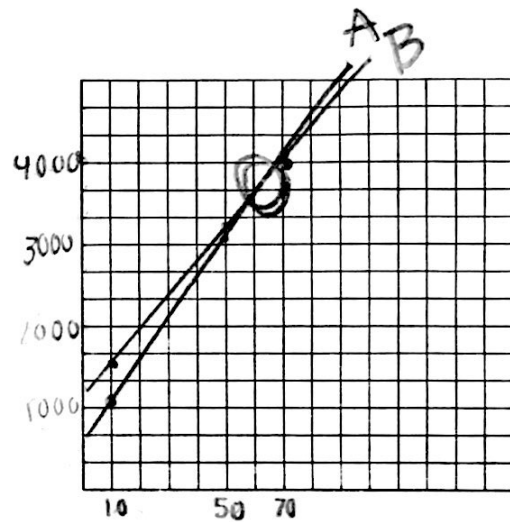
$$A: y = 50x + 600$$

$$B: y = 40x + 1200$$

$x = \text{\# of years}$

$y = \text{total cost}$

    b. Solve your system of equations by graphing. Be sure to label your axes.

Table:

Years	Fridge: A	B
0	600	1200
10	1100	1600
50	3100	3200
70	4100	4000

    c. After how many years are the total costs of owning the refrigerators equal?

$$\approx 65 \text{ years}$$