Essential Questions: What is a system of linear equations? How can we solve a linear system graphically?

Do Now:

a) On the same set of axes, graph the following lines.
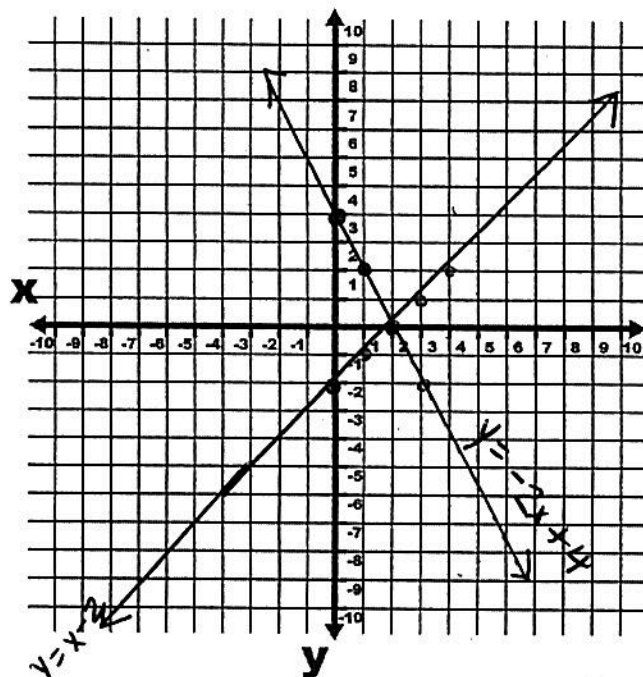
$y = -2x + 4$ $y = x - 2$

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

$b = 4$ $b = -2$

b) At which point do the lines intersect? ___$(2,0)$___


What is a System of Linear Equations?

- A **system** of linear equations, *also called a linear system*, consists of two or more linear equations that have the <u>same variables.</u>

- A **solution** of a system of linear equations with two variables is an **ordered pair** that satisfies all of the equations in the system. The **values of the variables** in the ordered pair **make each equation in the system true.**

- When graphing, you will encounter three possible solution sets.
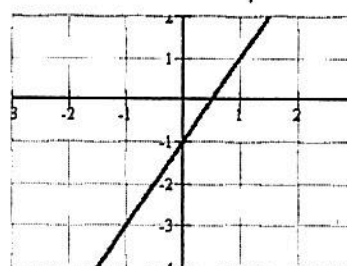
.. Intersecting Lines	Parallel Lines	Coinciding Lines
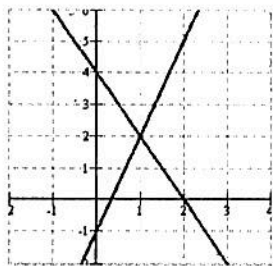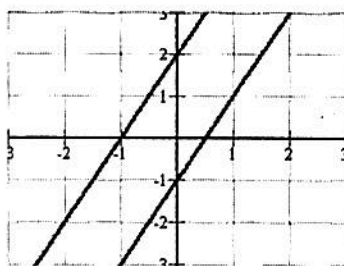
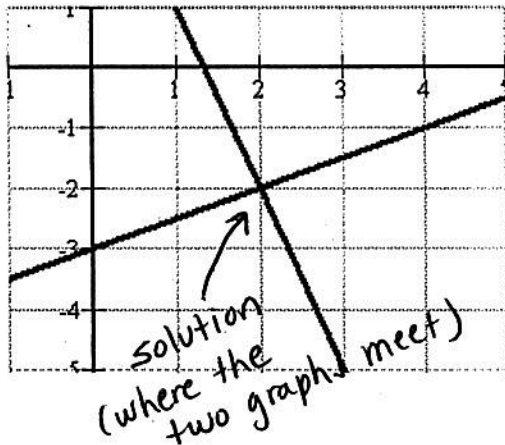

___1___ solution   ___0___ solution   ___infinite___ solutions

Parallel lines have the ___same___ slope and ___different___ y-intercepts.

Coinciding lines have the ___same___ slope and ___same___ y-intercepts.

1) What is the solution of the system graphed below?

1. (2, -2)
2. (-2, 2)
3. No solution
4. Infinitely many solutions

solution (where the two graphs meet)

2) Find the solution to the following system:

$-3x + 3y = 9$ $3y = 3x + 9$

$2x + y = 6$ $y = x + 3$

$y = -2x + 6$ $m = \frac{1}{1}$

$m = \frac{-2}{1}$ $b = 3$

$b = 6$

common solution (1, 4)

Algebraic Check:

$-3x + 3y = 9$ $2x + y = 6$
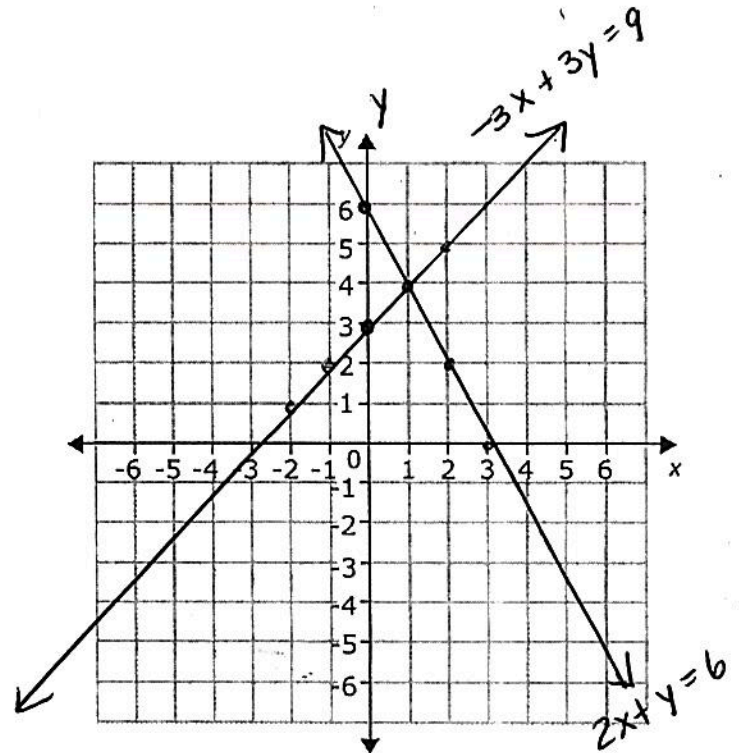
$-3(1) + 3(4) = 9$ $2(1) + 4 = 6$

$-3 + 12 = 9$ $2 + 4 = 6$

$9 = 9$ ✓ $6 = 6$

✓

Calculator Check:

1) Input both equations into y =
2) 2nd Trace (Calc)
3) #5 intersect
4) Enter 3x

Also check the table of values

The TAKE AWAY

To solve a linear system graphically, graph each __function (line)__. Identify the point of __intersection__. Check the solution with __both__ equations.

Checks can be done algebraically or using a graphing calculator. Linear systems have 3 possible solution sets: __one__ solution, __no__ solution or __infinite__ solutions.

3) One family fitness center has a $50 enrollment fee and costs $30 per month. Another center has no enrollment fee but costs $40 per month. Write an equation for each payment option. Let T represent the total amount paid to the fitness center and let m represent the number of months the fitness center is used.

Equation (Option 1): $T = 50 + 30m$

Equation (Option 2): $T = 40m$

a. Graph both cost equations over a 10 month period.

X (months)	Y (opt. 1)	Y (opt. 2)
0	50	0
1	80	40
2	110	80
3	140	120
4	170	160
5	200	200
6	230	240
7	260	280
8	290	320
9	320	360
10	350	400
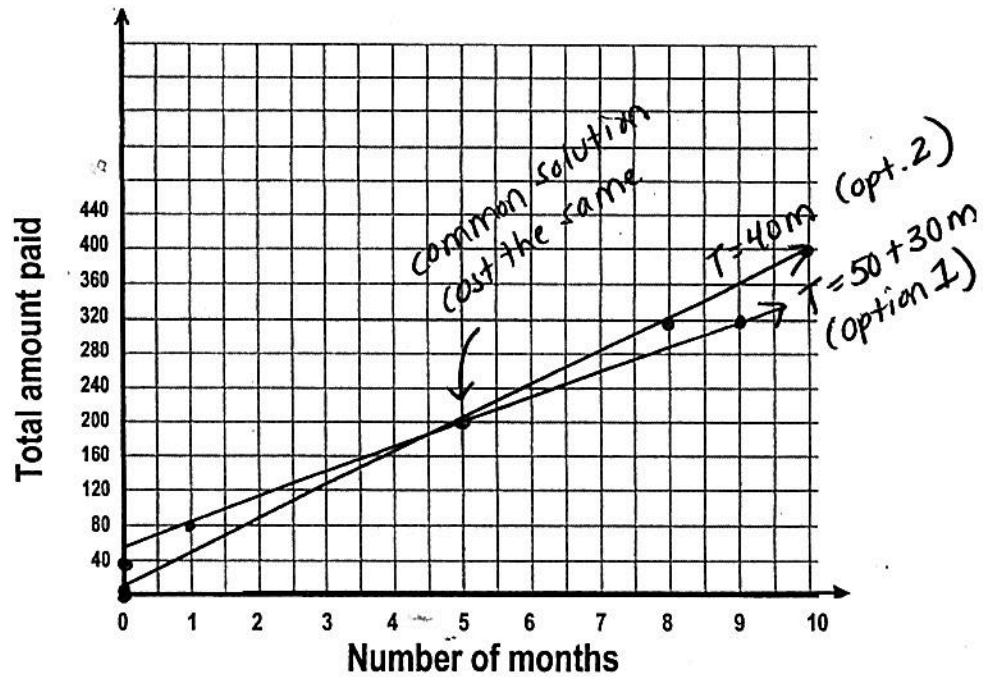
b. In how many months will both fitness centers cost the same?

5 months

Algebraic solution   set the equations equal to each other

$$50 + 30m = 40m$$
$$50 = 10m$$
$$5 = m$$

5 months