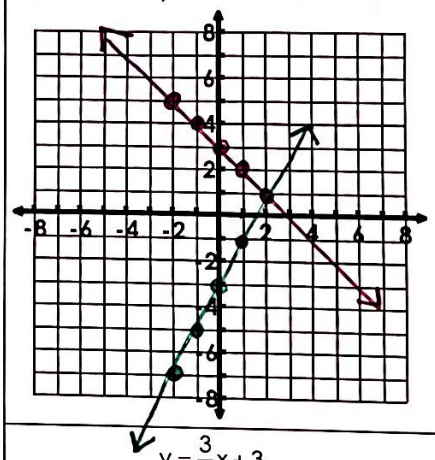
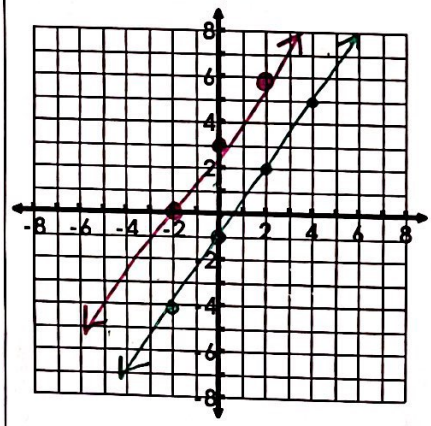
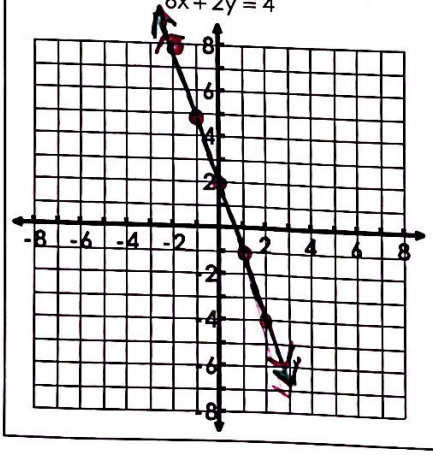
Day 1 – Graphing Systems of Equations – Notes

Two or more linear equations in the same variable form a **system of equations**. A **solution** to a system is a pair of numbers a and b for which x = a and y = b to make each equation a true statement. A solution is also the point where the two equations intersect each other on a graph.

Graph the following:	What Did You Notice?
$y = -x + 3$ $y = 2x - 3$ 	• Type of Solution: One Solution • Lines are intersecting • Different/Same y-intercept • Different Slopes
$y = \frac{3}{2}x + 3$ $3x - 2y = 2$ 	• Type of Solution: No Solution • Lines are parallel • Same Slopes • Different y-intercepts
$y = -3x + 2$ $6x + 2y = 4$ 	• Type of Solution: Infinite Solutions • Lines are the same • Same Slopes • Same y-intercepts

$3x - 2y = 2$

$-2y = -3x + 2$

$y = \frac{3}{2}x - 1$

x	$-x+3$	$2x-3$
-2	5	-7
-1	4	-5
0	3	-3
1	2	-1
2	1	1

(2, 1)

x	$\frac{3}{2}x+3$	$\frac{3}{2}x+1$
-2	0	-4
-1	1.5	-2.5
0	3	-1
1	4.5	0.5
2	6	2

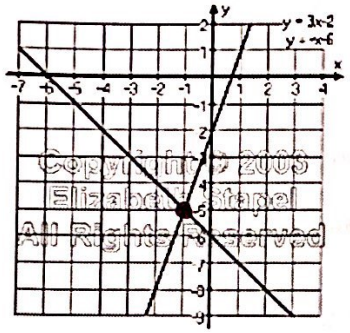
$6x + 2y = 4$

$2y = -6x + 4$

$y = -3x + 2$

x	$-3x+2$	$-3x+2$
-2	8	8
-1	5	5
0	2	2
1	-1	-1
2	-4	-4

Example: Find the solution of the linear equation and check your answer.



$(-1, -5)$

$y = 3x - 2$
$-5 = 3(-1) - 2$
$-5 = -3 - 2$
$-5 = -5$

$y = -x - 6$
$-5 = -(-1) - 6$
$-5 = 1 - 6$
$-5 = -5$

Examples: Check whether the ordered pair is a solution of the system of linear equations.

Ex. (1, 1)

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

Solution

$2(1) + 1 = 3$
$2 + 1 = 3$
$3 = 3$ ✓

$1 - 2(1) = -1$
$1 - 2 = -1$
$-1 = -1$ ✓

Ex. (-2, 4)

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

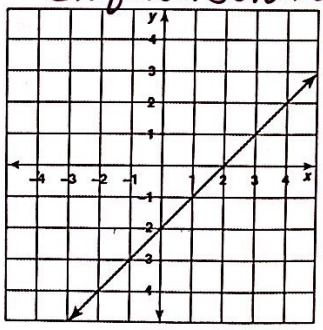
Not a Solution

$4(-2) + 4 = -4$
$-8 + 4 = -4$
$-4 = -4$ ✓

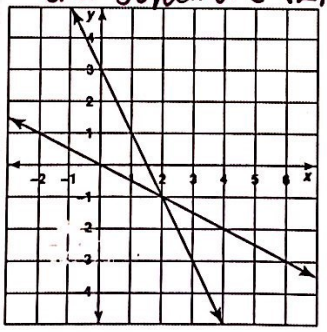
$-(-2) - 4 = 1$
$2 - 4 = 1$
$-2 \neq 1$
X

Practice: Tell how many solutions the systems of equations has. If it has one solution, name the solution.

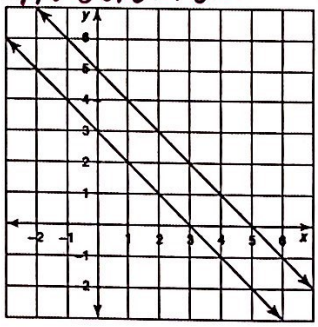
Infinite Solutions



One Solution (2, -1)



No Solution



Identify Solutions to a System from a Table

Remember, that the solution to a system of equations is where the two lines intersect each other. The point of the intersection is the **solution. The solution is where the x-value (input) produces the same y-value (output) for both equations.** Using the tables below, identify the solution.

a. $(3, -3)$

x	$y = -x$	$y = x - 6$
0	0	−6
3	−3	−3
6	−6	0
9	−9	3

b. $(1, 6)$

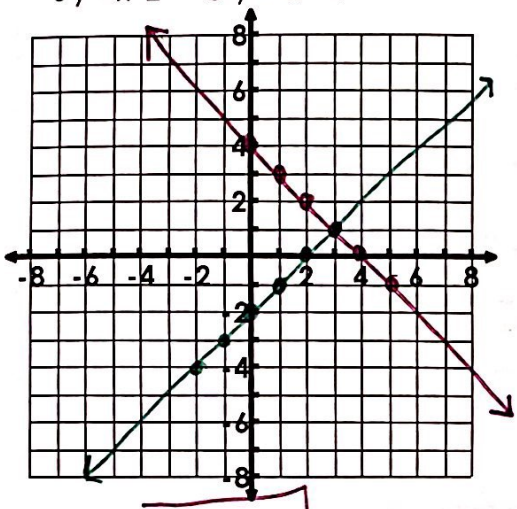
x	$y = 2x + 4$	$y = 4x + 2$
−2	0	−6
−1	2	−2
0	4	2
1	6	6

Solving a Linear System by Graphing

Step 1: Write each equation in slope intercept form (y = mx + b).
Step 2: Graph both equations in the same coordinate plane.
Step 3: Estimate the coordinates of the point of intersection.
Step 4: Check whether the coordinates give a true solution by substituting them into each equation of the original linear system.

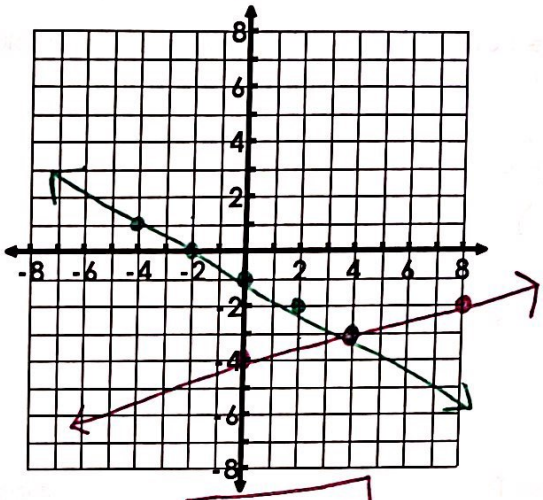
Example: Use the graph and check method to solve the linear equations.

A. • y = x -2 • y = -x + 4



(3, 1)

B. • y = -½x – 1 • y = ¼x - 4

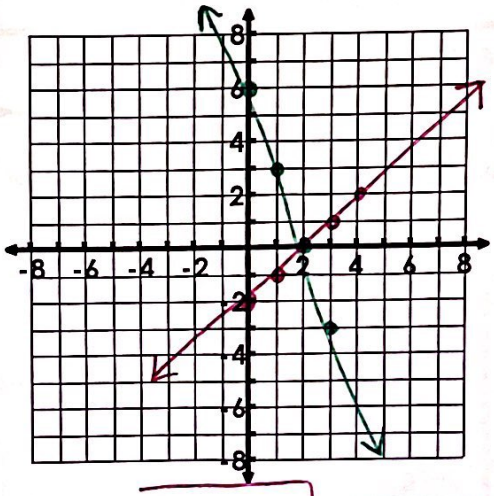


(4, -3)

C. • 3x + y = 6 • -x + y = -2

$-3x \quad -3x \qquad +x \quad +x$

$y = -3x + 6 \qquad y = x - 2$



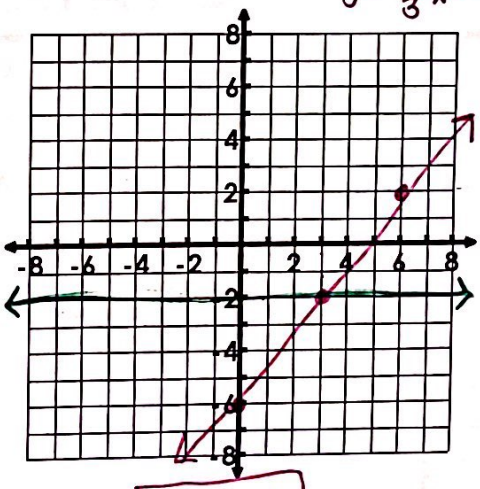
(2, 0)

D. • y = - 2 • 4x – 3y = 18

$-4x \quad -4x$

$\frac{-3y}{-3} = \frac{-4x}{-3} + \frac{18}{-3}$

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



(3, -2)