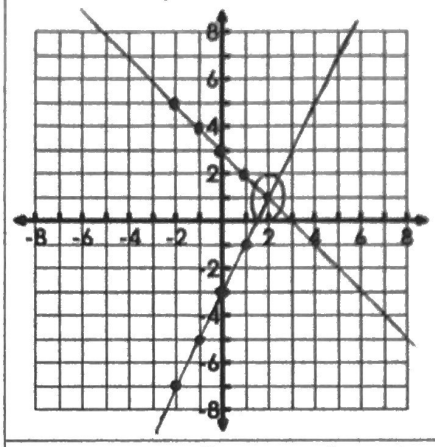
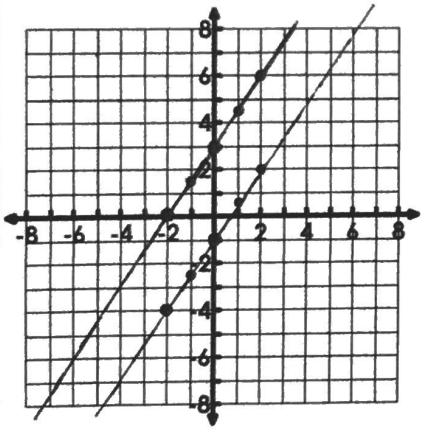
Graphing Systems of Equations

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.

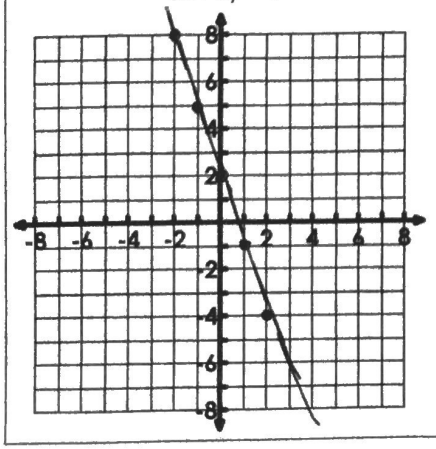
Graph the following:	What Did You Notice?
$y = -x + 3$ $y = 2x - 3$	• Type of Solution: ONE @ (2, 1) • Lines are intersecting • Different slopes • Different y-intercepts
$y = \frac{3}{2}x + 3$ $3x - 2y = 2$ → convert to $y = mx + b$: $-2y = 2 - 3x$, $y = -1 + \frac{3}{2}x$	• Type of Solution: NONE • Lines are parallel • Same slopes • Different y-intercepts
$y = -3x + 2$ $6x + 2y = 4$ → convert to $y = mx + b$: $2y = 4 - 6x$, $y = 2 - 3x$	• Type of Solution: INFINETELY MANY • Lines are the same/in top of each other • Same slopes • Same y-intercepts



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



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



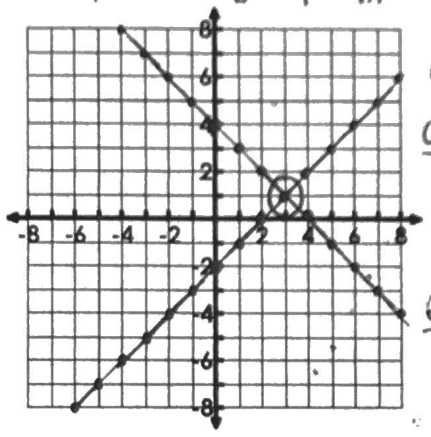
x	$y = -3x + 2$	$y = -3x + 2$
-2	8	8
-1	5	5
0	2	2
1	-1	-1
2	-4	-4

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. $y = x - 2$ $b = -2$ $m = \frac{+1}{+1}$
$y = -x + 4$ $b = 4$ $m = \frac{-1}{+1}$



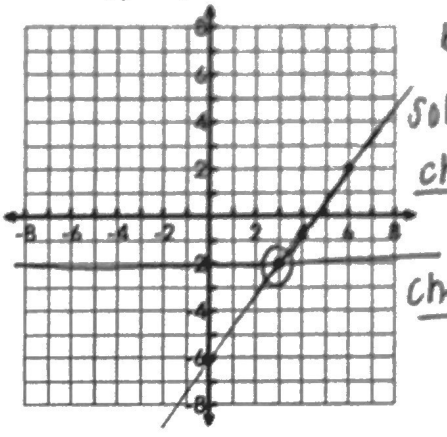
(x, y)
solution: (3, 1)

check: $y = x - 2$
$1 = 3 - 2$
$1 = 1$ ✓

check: $y = -x + 4$
$1 = -3 + 4$
$1 = 1$ ✓

B. $y = -2$ $b = -2$ $m = 0$
$4x - 3y = 18$

convert:
$4x - 3y = 18$
$\frac{-3y}{-3} = \frac{-4x + 18}{-3}$
$y = +\frac{4}{3}x - 6$
$b = -6$ $m = \frac{4}{3}$



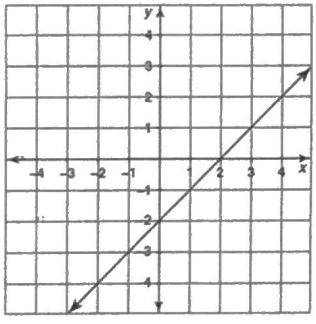
(x, y)
solution: (3, −2)

check: $y = -2$
$-2 = -2$ ✓

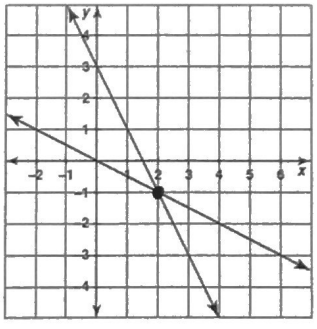
check: $y = \frac{4}{3}x - 6$
$-2 = \frac{4}{3}(3) - 6$
$-2 = 4 - 6$
$-2 = -2$ ✓

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

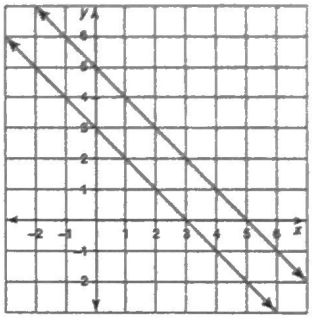
INFINITELY MANY



ONE (2, −1)



NONE



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.

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

solution: (3, −3)

b.

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

solution: (1, 6)