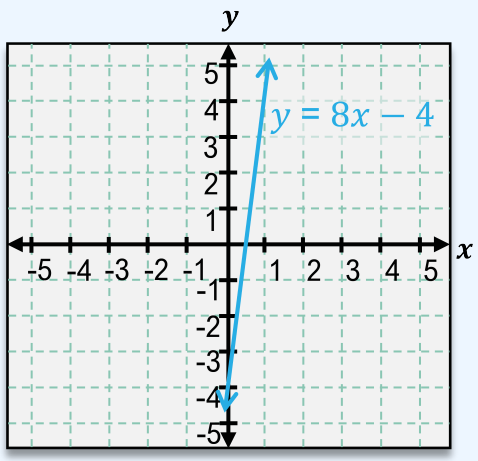
TOPIC: SOLVING SYSTEMS OF LINEAR EQUATIONS BY GRAPHING

Introduction to Systems of Linear Equations

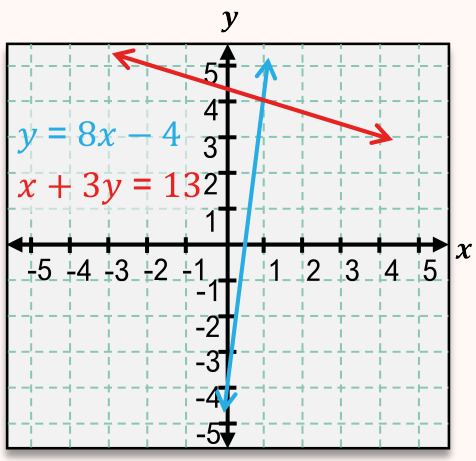
◆ Previously, we solved & plotted *single* equations on graphs. Now we'll look at **Systems of (_____) Equations**.

► To solve, find (x,y) which satisfy _____ equations. Graphically, this is where the lines _____.

Recall **Single Equation**



New **Multiple Equations a.k.a "System"**



EXAMPLE

Determine if each point is a solution to the equation.

(A) $(-2,0)$ (B) $(0,-4)$ (C) $(1,4)$

Solution: **[1 | MANY]** point(s)
satisfying **[1 | ALL]** line(s)

Determine if each point is a solution to the system of equations.

(A) $(0,-4)$ (B) $(-2,5)$ (C) $(1,4)$

Solution: **[1* | MANY]** point(s)
satisfying **[1 | ALL]** line(s)

* True for ***most*** problems, but there are other types of solutions

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Solve a System of Linear Equations by Graphing

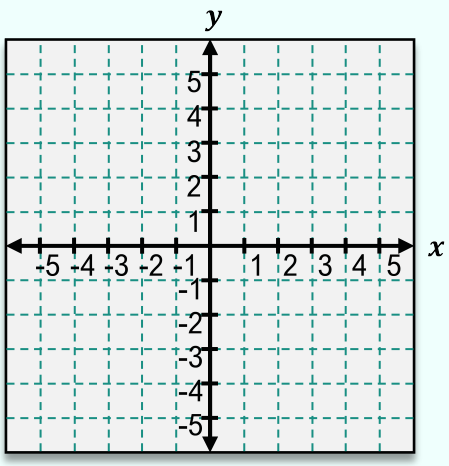
◆ To solve a system of equations graphically, plot the 2 lines ($y = mx + b$ form helps!) & find their _____.

► *Always* check the solution by plugging (x, y) of intersection into BOTH equations.

EXAMPLE Solve the system of equations by graphing.

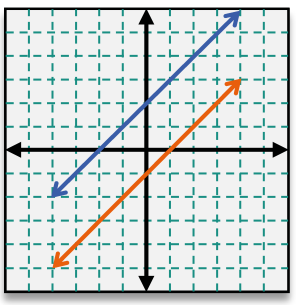
$$\begin{cases} y = x - 3 \\ 3x + y = 5 \end{cases}$$

Intersection Point: (__ , __)



◆ Most systems have 1 solution, but you might see…

Parallel Lines

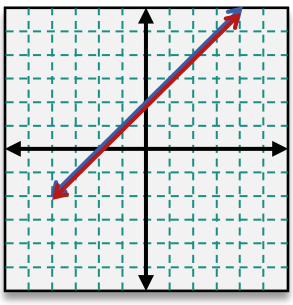


$y = x + 2$

$y = x - 1$

[0 | MANY] Solutions

Same Lines



$y = x + 2$

$2y = 2x + 4$

simplifies to

$y = x + 2$

[0 | MANY] Solutions

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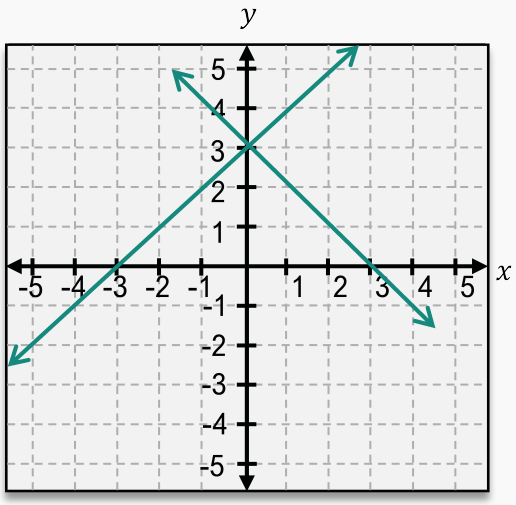
PRACTICE

Use the graph to identify the solution to the system of equations or identify that the system has 0 or infinitely many solutions. If there is a solution, check that the point satisfies both equations.

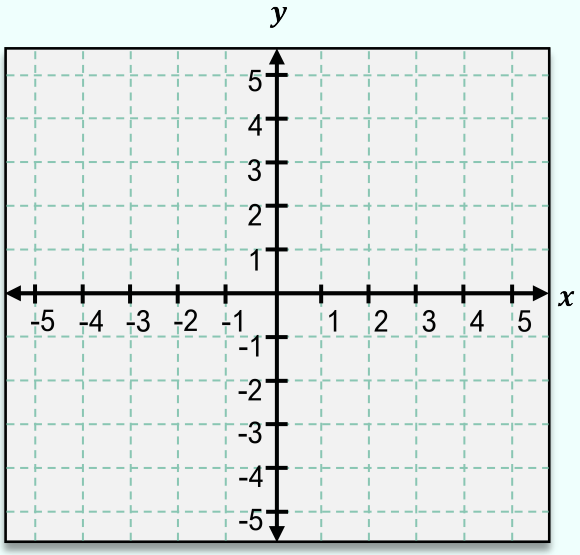


EXAMPLE

Graph the system of equations. Identify the intersection point, verify it is a solution to both equations.

$y = 2x + 3$

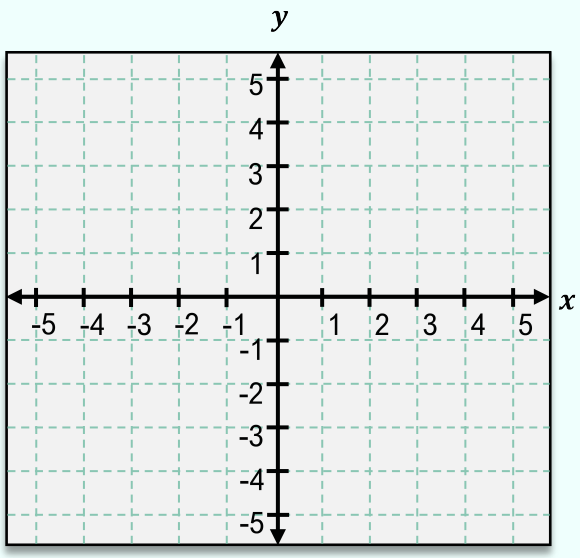
$y = x + 4$



TOPIC: SOLVING SYSTEMS OF LINEAR EQUATIONS BY GRAPHING

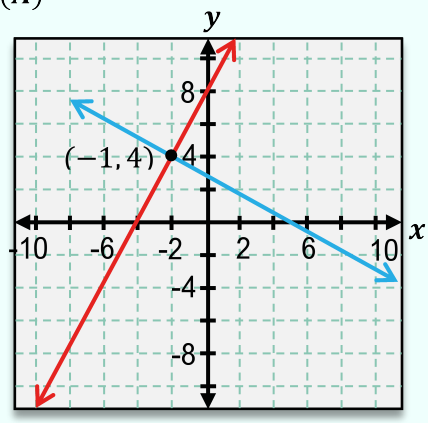
EXAMPLE Solve the system of equations by graphing.

$$\begin{cases} 6y + 2x = -6 \\ 3y + x = -3 \end{cases}$$

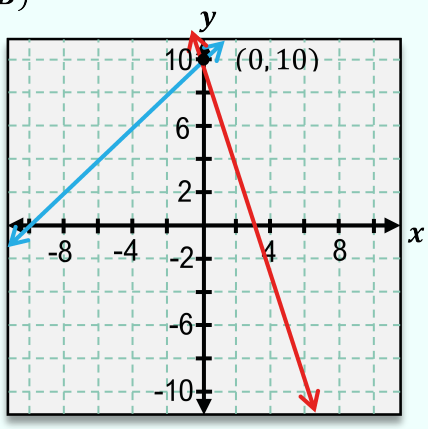


EXAMPLE Match each system of equations to its graph and solution.

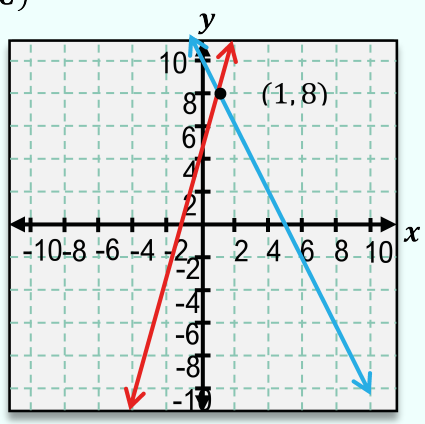
(A)



(B)



(C)



(1)

$$y = 3x + 5$$
$$y = -2x + 10$$

(2)

$$y = 4x + 8$$
$$2x + 3y = 10$$

(3)

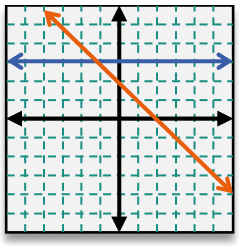
$$3x + y = 10$$
$$-x + y = 10$$

TOPIC: SOLVING SYSTEMS OF LINEAR EQUATIONS BY GRAPHING

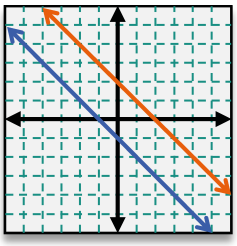
Determining Number of Solutions in a System

◆ Recall: There are **3 types** of system of equations based on the number of solutions they have.

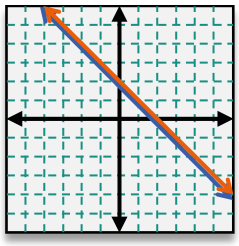
1 Solution



0 Solutions



Infinitely Many Solutions



◆ To find the # of solutions in a system *without graphing*, write equations as $y = mx + b$, _____ m's & b's.

(Slope-Intercept Form)

EXAMPLE Determine how many solutions each system has.

(A) $y = 3$ $\quad x + y = 2$

$m =$ $\quad m =$

$b =$ $\quad b =$

Slopes are **[SAME | DIFF]**

[1 | 0 | ∞] solutions

"Consistent" & "*Independent*"

(B) $y = -x - 1$ $\quad x + y = 2$

$m =$ $\quad m =$

$b =$ $\quad b =$

Slopes are **[SAME | DIFF]**

y-ints are **[SAME | DIFF]**

[1 | 0 | ∞] solutions

"Inconsistent"

(C) $-x - y = -2$ $\quad x + y = 2$

$m =$ $\quad m =$

$b =$ $\quad b =$

Slopes are **[SAME | DIFF]**

y-ints are **[SAME | DIFF]**

[1 | 0 | ∞] solutions

"Consistent" & "*Dependent*"

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PRACTICE Determine the number of solutions the system of equations has *without* graphing.

$(\boldsymbol{A})$

$$\begin{cases} y + 2x = 8 \\ y - 5x = -6 \end{cases}$$

(A) 1

(B) Infinitely Many

(C) 0

$(\boldsymbol{B})$

$$\begin{cases} y = \frac{1}{4}x + 11 \\ y = \frac{1}{4}x - 6 \end{cases}$$

(A) 1

(B) Infinitely Many

(C) 0

PRACTICE Without using a graph, determine the number of solutions in the following systems of equations, then classify the system.

$$\begin{cases} y + 2x = 8 \\ y - 5x = -6 \end{cases}$$

(A) Independent and Consistent

(B) Dependent and Consistent

(C) Inconsistent