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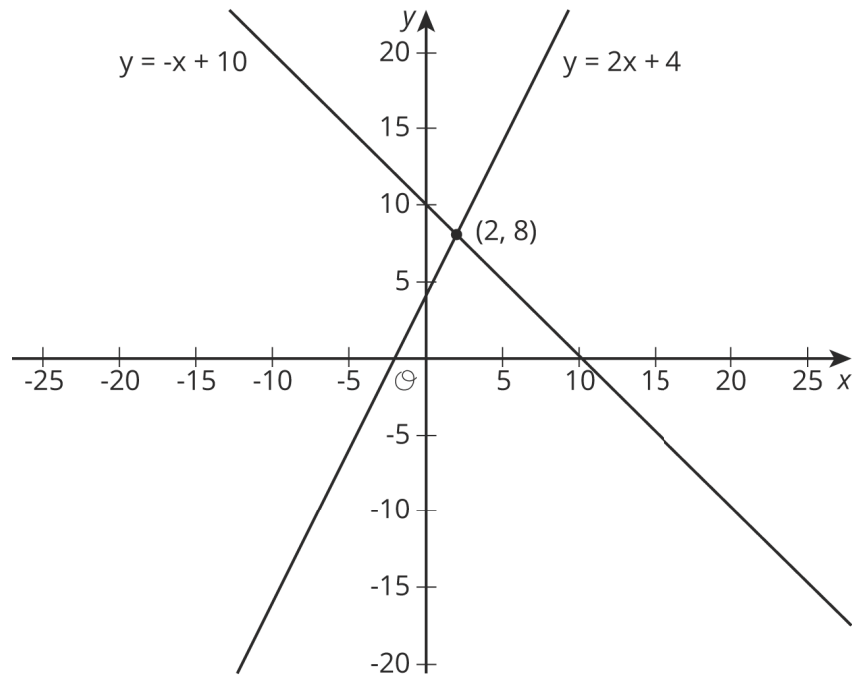
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Unit 4, Lesson 13: Solving Systems of Equations

Let's solve systems of equations.

13.1: True or False: Two Lines



Use the lines to decide whether each statement is true or false. Be prepared to explain your reasoning using the lines.

1. A solution to $8 = -x + 10$ is 2.
2. A solution to $2 = 2x + 4$ is 8.
3. A solution to $-x + 10 = 2x + 4$ is 8.
4. A solution to $-x + 10 = 2x + 4$ is 2.
5. There are no values of x and y that make $y = -x + 10$ and $y = 2x + 4$ true at the same time.

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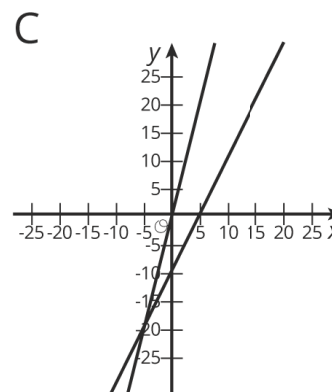
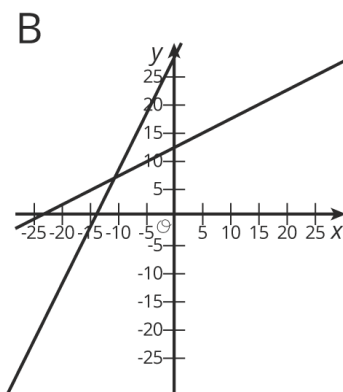
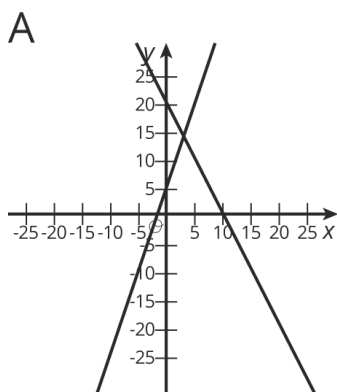
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13.2: Matching Graphs to Systems

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Here are three **systems of equations** graphed on a coordinate plane:



1. Match each figure to one of the systems of equations shown here.

a. $\begin{cases} y = 3x + 5 \\ y = -2x + 20 \end{cases}$

b. $\begin{cases} y = 2x - 10 \\ y = 4x - 1 \end{cases}$

c. $\begin{cases} y = 0.5x + 12 \\ y = 2x + 27 \end{cases}$

2. Find the solution to each system and check that your solution is reasonable based on the graph.

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13.3: Different Types of Systems

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Your teacher will give you a page with some systems of equations.



1. Graph each system of equations carefully on the provided coordinate plane.
2. Describe what the graph of a system of equations looks like when it has . . .
 - a. 1 solution
 - b. 0 solutions
 - c. infinitely many solutions

Are you ready for more?

The graphs of the equations $Ax + By = 15$ and $Ax - By = 9$ intersect at $(2, 1)$. Find A and B . Show or explain your reasoning.

Lesson 13 Summary

Sometimes it is easier to solve a system of equations without having to graph the equations and look for an intersection point. In general, whenever we are solving a system of equations written as

$$\begin{cases} y = [\text{some stuff}] \\ y = [\text{some other stuff}] \end{cases}$$

we know that we are looking for a pair of values (x, y) that makes both equations true. In particular, we know that the value for y will be the same in both equations. That means that

$$[\text{some stuff}] = [\text{some other stuff}]$$

For example, look at this system of equations:

$$\begin{cases} y = 2x + 6 \\ y = -3x - 4 \end{cases}$$

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Since the y value of the solution is the same in both equations, then we know

$$2x + 6 = -3x - 4$$

We can solve this equation for x :

$$2x + 6 = -3x - 4$$

$$5x + 6 = -4$$

$$5x = -10$$

$$x = -2$$

add $3x$ to each side

subtract 6 from each side

divide each side by 5

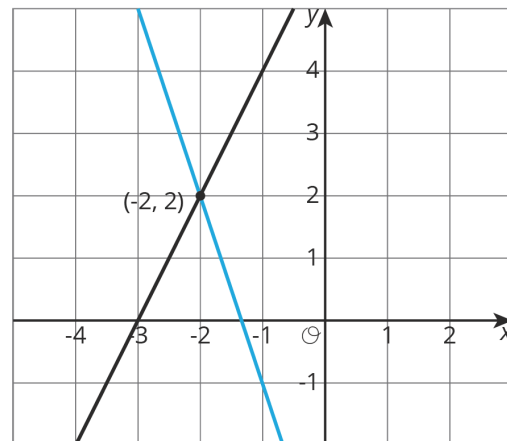
But this is only half of what we are looking for: we know the value for x , but we need the corresponding value for y . Since both equations have the same y value, we can use either equation to find the y -value:

$$y = 2(-2) + 6$$

Or

$$y = -3(-2) - 4$$

In both cases, we find that $y = 2$. So the solution to the system is $(-2, 2)$. We can verify this by graphing both equations in the coordinate plane.



In general, a system of linear equations can have:

- No solutions. In this case, the lines that correspond to each equation never intersect.
- Exactly one solution. The lines that correspond to each equation intersect in exactly one point.
- An infinite number of solutions. The graphs of the two equations are the same line!

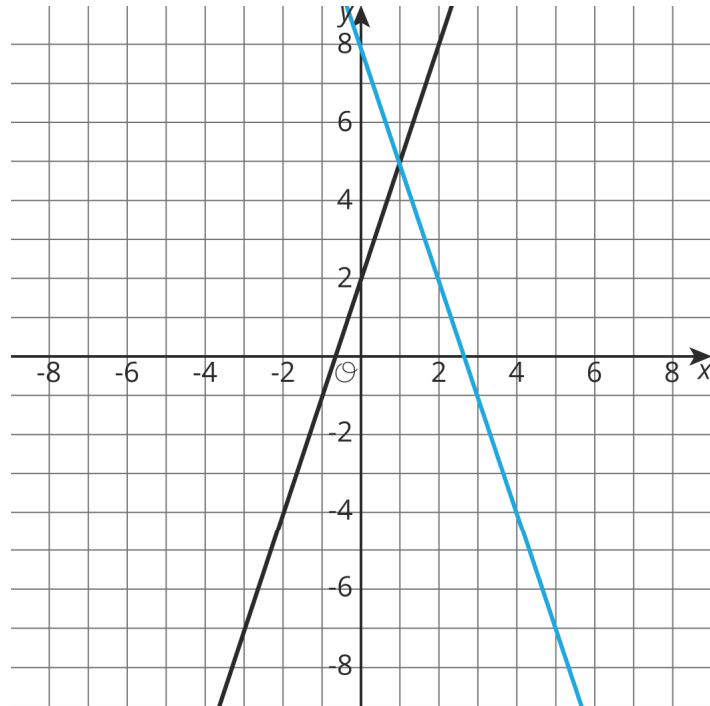
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Unit 4, Lesson 13: Solving Systems of Equations

1. a. Write equations for the lines shown.



- b. Describe how to find the solution to the corresponding system by looking at the graph.

- c. Describe how to find the solution to the corresponding system by using the equations.

2. The solution to a system of equations is $(5, -19)$. Choose two equations that might make up the system.

- A. $y = -3x - 6$
- B. $y = 2x - 23$
- C. $y = -7x + 16$
- D. $y = x - 17$
- E. $y = -2x - 9$

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3. Solve the system of equations: $\begin{cases} y = 4x - 3 \\ y = -2x + 9 \end{cases}$

4. Solve the system of equations: $\begin{cases} y = \frac{5}{4}x - 2 \\ y = \frac{-1}{4}x + 19 \end{cases}$

5. Here is an equation: $\frac{15(x-3)}{5} = 3(2x - 3)$

a. Solve the equation by using the distributive property first.

b. Solve the equation without using the distributive property.

c. Check your solution.

(from Unit 4, Lesson 6)