

HW Page 58

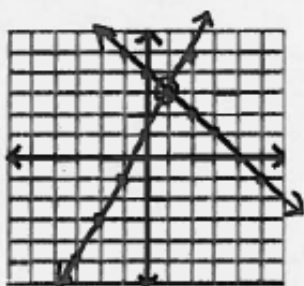
## Solving Systems by Graphing

Name Key  
Date \_\_\_\_\_ Per. \_\_\_\_\_

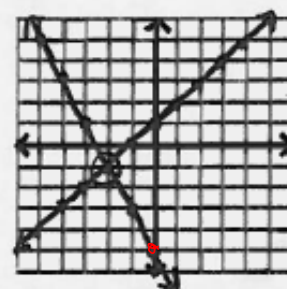
Solve each system of equations by graphing it on the coordinate plane provided. Then name the solution point (x, y).

$$-2 = \frac{-2}{1} = \frac{2}{-1}$$

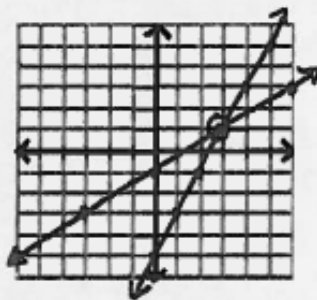
1. 
$$\begin{cases} y = -x + 4 \\ y = 2x + 1 \end{cases}$$

solution:  
( 1 , 3 )

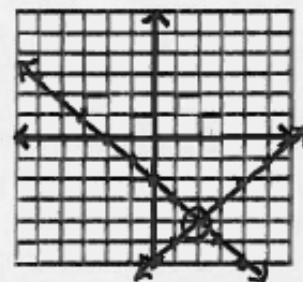
2. 
$$\begin{cases} y = x + 1 \\ y = -2x - 5 \end{cases}$$

solution:  
( -2 , -1 )

3. 
$$\begin{cases} y = \frac{2}{3}x - 1 \\ y = 2x - 5 \end{cases}$$

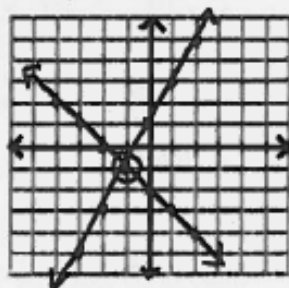
solution:  
( 3 , 1 )

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

solution:  
( 2 , -4 )

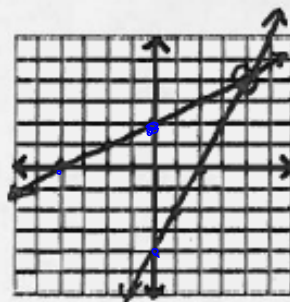
5. 
$$\begin{cases} y = 2x + 1 \\ x + y = -2 \end{cases}$$

✓ solution:  
 $(-1, -1)$



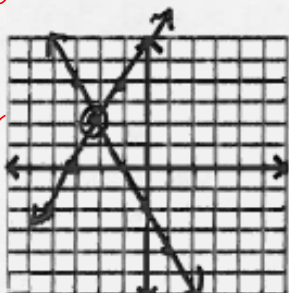
6. 
$$\begin{cases} -2x + 4y = 8 \\ 2x - y = 4 \end{cases}$$

solution:  
 $(4, 4)$



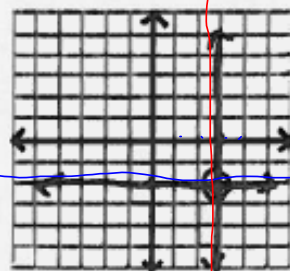
7. 
$$\begin{cases} 2x + y = -2 \\ -6x + 3y = 18 \end{cases}$$

✓ solution:  
 $(-2, 2)$



8. 
$$\begin{cases} y = -2 \\ x = 3 \end{cases}$$

solution:  
 $(3, -2)$







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**6-2 Solving Systems Using Substitution**

Another method of solving a system of equations is the substitution  
method. By replacing one variable with an equivalent expression  
containing the other variable, you can make a one-variable equation that you can solve.

Discovery:

If:  =    

Then:  +  +  = 

**Example 1: Using Substitution**

a. Solve using substitution.

Step 0: Isolate a variable

Step 1: Substitute  $-2x+5$  in for  $y$  in the second equation.Step 2: Solve for  $x$ .Step 3: Use your answer for  $x$  to solve for  $y$ .

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

Handwritten work for the system:

$$x + (-2x + 5) = 3$$

$$-1x + 5 = 3$$

$$-1x = -2$$

$$x = 2$$

Substituting  $x = 2$  into the second equation:

$$2 + y = 3$$

$$y = 1$$

The solution to the system is ( 2 , 1 )

If the point works algebraically in both equations, then you know you have the right solution point to both lines.

Check:

$$\begin{array}{l|l} y = -2x + 5 & 2 + 1 = 3 \\ 1 = -2(2) + 5 & \text{True} \\ 1 = -4 + 5 & \\ \text{True} & \end{array}$$

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**Example 1 Continued:**

b. Solve using substitution.

$$\begin{cases} x = 3y + 1 \\ x + 4y = 15 \end{cases}$$

c. Solve using substitution.

$$\begin{cases} y = 2x - 8 \\ y = -3x + 2 \end{cases}$$

✓ Understanding Check:

Solve using substitution. Check your solution.

$$\text{a. } \begin{cases} y = 2x - 3 \\ 3x + y = 12 \end{cases}$$

$$\text{b. } \begin{cases} x = -2y \\ x - y = -12 \end{cases}$$

$$\text{c. } \begin{cases} y = 6x + 14 \\ y = -x + 21 \end{cases}$$

$$\text{d. } \begin{cases} y + 5x = 18 \\ y = 4x \end{cases}$$

a.  $\begin{cases} y = 2x - 3 \\ 3x + y = 12 \end{cases}$

Substitution:

$$3x + 2x - 3 = 12$$

$$5x - 3 = 12$$

$$\quad \quad \quad +3$$

$$\hline 5x = 15$$

$$\quad \quad \quad \div 5$$

$$x = 3$$

Substitution:

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

$$y = 6 - 3$$

$$y = 3$$

Solution:  $(3, 3)$

b.  $\begin{cases} x = -2y \\ x - y = -12 \end{cases}$

Substitution:

$$-2y - y = -12$$

$$-3y = -12$$

$$\quad \quad \quad \div -3$$

$$y = 4$$

Substitution:

$$x = -2(4)$$

$$x = -8$$

Solution:  $(-8, 4)$

c.  $\begin{cases} y = 6x + 14 \\ y = -x + 21 \end{cases}$

Substitution:

$$6x + 14 = -x + 21$$

$$+x \quad \quad \quad +x$$

$$\hline 7x + 14 = 21$$

$$\quad \quad \quad -14$$

$$\hline 7x = 7$$

$$\quad \quad \quad \div 7$$

$$x = 1$$

Substitution:

$$y = 6(1) + 14$$

$$y = 6 + 14$$

$$y = 20$$

Solution:  $(1, 20)$

d.  $\begin{cases} y + 5x = 18 \\ y = 4x \end{cases}$

Substitution:

$$4x + 5x = 18$$

$$9x = 18$$

$$\quad \quad \quad \div 9$$

$$x = 2$$

Substitution:

$$y = 4(2)$$

$$y = 8$$

Solution:  $(2, 8)$

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**Example 2: Using Substitution and the Distributive Property**

Solve using the substitution method. Check your solution.

Step 0: Isolate a variable.

$$\begin{cases} y = 4x + 11 \\ -6x + 8y = 36 \end{cases}$$

Step 1: Substitute  $4x+11$  in for  $y$  in the second equation.Step 2: Distribute the 8, then solve for  $x$ .Step 3: Use your answer to go back and solve for  $y$ .

$$-6x + 8(4x + 11) = 36$$

$$-6x + 32x + 88 = 36$$

$$26x + 88 = 36$$

$$26x = -52$$

$$x = -2$$

$$y = 4(-2) + 11$$

$$y = -8 + 11$$

$$y = 3$$

$$\text{Soln: } (-2, 3)$$

al Understanding Check

✓ Understanding Check:

Solve using substitution. Check your solution.

$$\text{a. } \begin{cases} y = -3x + 6 \\ 5x + 2y = 15 \end{cases}$$

$$\text{* b. } \begin{cases} x = 6y + 1 \\ 4y - x = -9 \end{cases}$$

$$\text{c. } \begin{cases} 5m - 2n = 22 \\ n = 4m - 2 \end{cases}$$

$$4y - (6y + 1) = -9$$

$$4y - 6y - 1 = -9$$

$$-2y - 1 = -9$$

$$-2y = -8$$

$$y = 4$$

Understanding Check:

Solve using substitution. Check your solution.

a.  $\begin{cases} y = -3x + 6 \\ 5x + 2y = 15 \end{cases}$

$$5x + 2(-3x + 6) = 15$$

$$5x - 6x + 12 = 15$$

$$-x + 12 = 15$$

$$\begin{array}{r} -x + 12 = 15 \\ \quad \quad \quad \downarrow -12 \\ -x = 3 \\ \quad \quad \quad \downarrow -1 \\ x = -3 \end{array}$$

$$y = -3(-3) + 6$$

$$y = 9 + 6$$

$$y = 15 \rightarrow (-3, 15)$$

\* b.  $\begin{cases} x = 6y + 1 \\ 4y - x = -9 \end{cases}$

$$4y - (6y + 1) = -9$$

$$4y - 6y - 1 = -9$$

$$\begin{array}{r} 4y - 6y - 1 = -9 \\ \quad \quad \quad \downarrow +1 \\ -2y = -8 \\ \quad \quad \quad \downarrow -2 \\ y = 4 \end{array}$$

$$x = 6(4) + 1$$

$$x = 24 + 1$$

$$x = 25$$

$$(25, 4)$$

c.  $\begin{cases} 5m - 2n = 22 \\ n = 4m - 2 \end{cases}$  \* List final answer (m, n)

$$5m - 2(4m - 2) = 22$$

$$5m - 8m + 4 = 22$$

$$\begin{array}{r} 5m - 8m + 4 = 22 \\ \quad \quad \quad \downarrow -4 \\ -3m = 18 \\ \quad \quad \quad \downarrow -3 \\ m = -6 \end{array}$$

$$n = 4(-6) - 2$$

$$n = -24 - 2$$

$$n = -26$$

$$(-6, -26)$$

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**Example 3: Using Substitution with Equations with no Isolated Variable**

Solve using the substitution method.  
Check your solution.

Step 1: Isolate a variable.

Step 2: Substitute  $-2x-1$  in for  $y$  in the first equation.

Step 3: Distribute and solve for  $x$ .

Step 4: Go back with  $x = -1$  and solve for  $y$ .

$$\begin{cases} 2y = 6x + 8 \\ x + 1 = -2x \end{cases}$$

$$x + 1 = -2x$$

$$y = -2x - 1$$

$$2(-2x - 1) = 6x + 8$$

$$-4x - 2 = 6x + 8$$

$$-10x = 10$$

$$x = -1$$

$$y = -2(-1) - 1$$

$$y = 2 - 1$$

$$y = 1 \quad \text{Solution: } (-1, 1)$$

✓ Understanding Check:

Solve using substitution. Check your solution.

a. 
$$\begin{cases} y - 2 = -2x \\ 3x - 17 = 2y \end{cases}$$

b. 
$$\begin{cases} x - y = 2 \\ 4x - 3y = 11 \end{cases}$$

c. 
$$\begin{cases} y - 3x = -14 \rightarrow y = \boxed{3x - 14} \\ \textcircled{y} - x = -10 \end{cases}$$

$$(3x - 14) - x = -10$$

$$2x - 14 = -10$$

$$2x = 4$$

$$\textcircled{x = 2} =$$

d. 
$$\begin{cases} y + 5x = 4 \\ y - 7x = -20 \end{cases}$$

a. 
$$\begin{aligned} y - 2 &= -2x \\ \xrightarrow{+2} & y = -2x + 2 \end{aligned}$$

$$3x - 17 = 2y$$

$$3x - 17 = 2(-2x + 2)$$

$$3x - 17 = -4x + 4$$

$$\begin{array}{r} +4x \quad \xrightarrow{+17} \\ \hline 7x = 21 \end{array}$$

$$\frac{7x}{7} = \frac{21}{7} \quad y = -2(3) + 2$$

$$x = 3 \quad y = -4 \quad \boxed{(3, -4)}$$

b. 
$$\begin{aligned} x - y &= 2 \\ \xrightarrow{+y} & x = y + 2 \end{aligned}$$

$$4x - 3y = 11$$

$$4(y + 2) - 3y = 11$$

$$4y + 8 - 3y = 11$$

$$y + 8 = 11$$

$$\xrightarrow{-8} y = 3$$

$$x = 3 + 2$$

$$x = 5$$

$$\boxed{(5, 3)}$$

c. 
$$\begin{aligned} y - 3x &= -14 \\ y - x &= -10 \\ \xrightarrow{+x} & y = x - 10 \end{aligned}$$

$$x - 10 - 3x = -14$$

$$\begin{array}{r} \xrightarrow{+10} \\ \hline -2x = -4 \end{array}$$

$$x = -2$$

$$y = -2 - 10$$

$$y = -12$$

$$\boxed{(-2, -12)}$$

d. 
$$\begin{aligned} y + 5x &= 4 \\ \xrightarrow{-5x} & y = -5x + 4 \end{aligned}$$

$$y - 7x = -20$$

$$(-5x + 4) - 7x = -20$$

$$\begin{array}{r} \xrightarrow{-4} \\ \hline -12x = -24 \\ \xrightarrow{-12} \end{array}$$

$$x = 2$$

$$y = -5(2) + 4$$

$$y = -10 + 4$$

$$y = -6$$

$$\boxed{(2, -6)}$$