Algebra 1

Lesson 7.2

Solve Linear Systems by Substitution

Warm-Up

Solve the systems of linear equations by graphing.

(a) $2x+y=-3$ → $y=-2x-3$

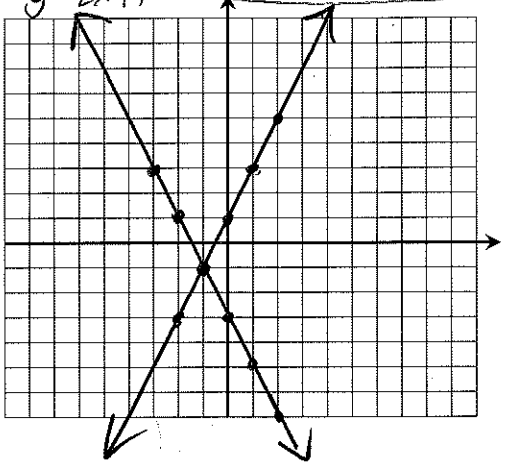
$-6x+3y=3$ → $y=2x+1$

$+6x \quad +6x$

$3y=6x+3$

$y=2x+1$

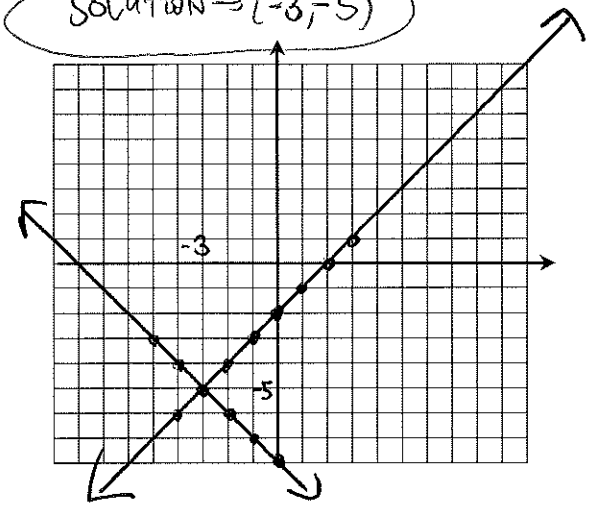
SOLUTION → $(-1,-1)$



(b) $y=x-2$

$y=-x-8$

SOLUTION → $(-3,-5)$



Example 1. Using the Substitution Method

Consider the following system of linear equations:

$y=x-1$

$2x-y=4$

(a) Solve one of the equations for one of the variables (ex. $y=$ or $x=$).

(b) Substitute the first equation into the second equation.

(c) Solve that equation for the remaining variable.

(d) Evaluate the 1st equation by substituting the solution from (c).

(e) Check the solution in the two original equations.

(a) $y=x-1$

(b) $2x-y=4$

$2x-(x-1)=4$

$2x-x+1=4$

$x+1=4$

(c) $x=3$

(d) $y=x-1$

$y=(3)-1$

$y=2$

$(3,2)$

CHECK

(e)

$y=x-1$	$2x-y=4$
$(2)=(3)-1$	$2(3)-(2)=4$
$2=2$ ✓	$6-2=4$
	$4=4$ ✓

Example 2. Using the Substitution Method
Consider the following system of linear equations:

$3x+4y=4$

$x+3y=-2$

(a) Solve the second equation for the variable x (ex. $x=$).

(b) Substitute the second equation into the first equation.

(c) Solve the equation for the remaining variable.

(d) Evaluate the 2nd equation by substituting the solution from (c).

(e) Check the solution in the two original equations.

(a) $x+3y=-2$
$-3y \quad -3y$
$x=-3y-2$

(b) $3x+4y=4$
$3(-3y-2)+4y=4$
$-9y-6+4y=4$
$-5y=10$

(c) $y=-2$

$(4,-2)$

(d) $x=-3y-2$
$x=-3(-2)-2$
$x=6-2$
$x=4$

(e) CHECK
$3x+4y=4$ | $x+3y=-2$
$3(4)+4(-2)=4$ | $(4)+3(-2)=-2$
$12-8=4$ | $4-6=-2$
$4=4$ ✓ | $-2=-2$ ✓

Try It!
Use the substitution method to solve each system. *You might need a separate sheet of paper!*

(a)
$x=5y$
$x-3y=6$

$(5y)-3y=6$
$2y=6$
$y=3$

$x=5(3)$
$x=15$

$(15,3)$

(b)
$x-y=1$
$y=-x+5$

$x-(-x+5)=1$
$x+x-5=1$
$2x=6$
$x=3$

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

$(3,2)$

(c)
$3x-2y=-3$
$3x+y=3$
$-3x \quad -3x$
$y=-3x+3$

$3x-2(-3x+3)=-3$
$3x+6x-6=-3$
$9x=3$
$x=\frac{1}{3}$

$y=-3(\frac{1}{3})+3$
$y=2$

$(\frac{1}{3},2)$

Assignment
New: Pg. 439 #2, 8 – 20 (evens), 31

Review:
Graph and Check to solve the linear system.

1. $y=\frac{1}{2}x+5$
$y=-3x+5$

2. Store A charges \$3 per square foot for wall-to-wall carpet and charges \$85 for installation. Store B charges \$2 per square foot for the same carpet and charges \$100 for installation. Use a graph to determine the square footage for which the total cost of the carpet and installation at each store is the same.

3. A bag contains quarters and dimes. There are 15 coins in the bag. The value of the coins is \$2.70. Use substitution to determine the number of quarters and dimes in the bag.