



**7 - 2**

# **Substitution**



**Substitution is another way  
to solve systems of equations  
(besides graphing).**



**Solve one of the two equations for one variable, and then substitute that into the second equation.**

Ex:

$$y = 3x$$

$$x + 2y = -21$$

$$(-3, -9)$$

$$x + 2(3x) = -21$$

$$\frac{x}{1} = \frac{-21}{7}$$

$$x = -3$$

$$y = 3(-3) \quad y = -9$$

Ex:  $x + 5y = -3 \rightarrow$  solve for  $x$   
 $3x - 2y = 8$

$$\begin{array}{r} x + 5y = -3 \\ -5y \quad -5y \\ \hline \end{array}$$

$$x = -3 - 5y$$

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

$$\begin{array}{r} x - 5 = -3 \\ +5 \quad +5 \\ \hline \end{array}$$

$x = 2$

$$3(-3 - 5y) - 2y = 8$$

$$\begin{array}{r} -9 - 15y - 2y = 8 \\ \hline \end{array}$$

$$\begin{array}{r} -9 - 17y = 8 \\ +9 \quad +9 \\ \hline \end{array}$$

$$\begin{array}{r} -17y = 17 \\ -17 \quad -17 \\ \hline \end{array}$$

$(2, -1)$

$y = -1$

Ex:  $6x - 2y = -4$

$y = 3x + 2$

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

~~$6x - 6x - 4 = -4$~~

$-4 = -4$

infinitely many

**Ex:**  $2x + 2y = 8$   
 $x + y = -2$

$$-4 = 8$$

no solution

Ex:  $\overset{-4x}{\cancel{4x}} + y = \overset{-4x}{\cancel{12}} \rightarrow y = 12 - 4x$   
 $-2x - 3y = 14$

$$-2x - 3(12 - 4x) = 14$$

$$\underline{-2x} - 36 + \underline{12x} = 14$$

$$10x - \cancel{36} = 14$$
$$+ \cancel{36} + 36$$

$$10x = 50$$

$$\boxed{x = 5}$$

$$y = 12 - 4(5)$$
$$y = 12 - 20$$

$$\boxed{y = -8}$$

$$\boxed{(5, -8)}$$





Homework:

p. 379 #12 - 22 even