Solve each system using substitution. Check your answer by graphing on the calculator.

SOLVE. PLUG-IN. SOLVE. PLUG-IN. SOLVE.

1.) $6x + 3y = 54$
$2x + y = 18$

2.) $2x - 2y = 14$
$x - 2y = 2$

① $2x + y = 18$
$\underline{-2x \qquad -2x}$
$y = \boxed{-2x + 18}$

② $6x + 3(-2x + 18) = 54$
③ $\boxed{6x} - \boxed{6x} + 54 = 54$
$54 = 54 \begin{cases} \text{inf.} \\ \text{sol.} \end{cases}$

① $x - 2y = 2$
$\underline{+2y \quad +2y}$
$x = 2y + 2$

$2(2y + 2) - 2y = 14$
$4y + 4 - 2y = 14$
$2y + 4 = 14$
$y = 5$

$x - 2(5) = 2$
$x - 10 = 2$
$x = 12$
$(12, 5)$

3.) $x - y = -10$
$2x + 4y = 22$

① $x - y = -10$
$\underline{+y \qquad +y}$
$x = y - 10$

$2(y - 10) + 4y = 22$
$2y - 20 + 4y = 22$
$6y - 20 = 22$
$\underline{+20 \quad +20}$
$6y = 42$
$y = 7$

$x - y = -10$
$x - 7 = -10$
$\underline{+7 \quad +7}$
$x = -3$
$(-3, 7)$

4.) $x - 2y = 1$
$3x - 6y = 3$

$y = -x + 4$
$y = 3x + 12$

$-x + 4 = 3x + 12$
$4 = 4x + 12$

ELIMINATION METHOD

Main Ideas/Questions	Notes
WHAT IS IT?	a method for solving systems of equations in which you add or subtract the equations to eliminate a variable.
STEPS TO SOLVE	**Step 1:** Make sure equations are lined up! **Step 2:** ___+___ or ___−___ equations to eliminate the variable with common _coefficient_ **Step 3:** _solve_ the equation for the remaining variable. **Step 4:** _plug-in_ your answer into either original equation and _solve_ for the other variable.

Solving Using Elimination

Ex. 1) $y = 3x + 4$
$y = x - 2$

Are the equations lined up?
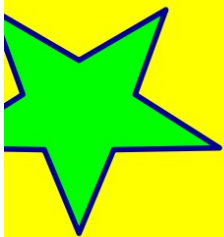Do x or y have matching coefficients?
Eliminate x or y?
Are the signs the same or different?
Add or subtract?

$$(-) \quad y = 3x + 4$$
$$y = x - 2$$
$$\overline{}$$
$$0 = 2x + 6$$
$$-6 \qquad\qquad -6$$
$$\overline{}$$
$$\frac{-6}{2} = \frac{2x}{2}$$
$$-3 = x$$

$$y = -3 - 2$$
$$y = -5$$

$$(-3, -5)$$

Solving Using Elimination
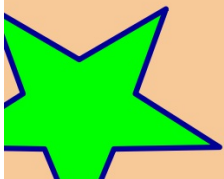
Ex. 2) x + 4y = 13
     x - y = 3

✓Are the equations lined up?
Do x or y have matching coefficients?
Eliminate x or y?
Are the signs the same or different?
Add or subtract?

$$(-)\begin{array}{l} x + 4y = 13 \\ x - y = 3 \end{array}$$

$$\dfrac{5y}{5} = \dfrac{10}{5}$$

$$y = 2$$

$$x + 4(2) = 13$$
$$x + 8 = 13$$
$$x = 5$$

$$(5, 2)$$

Solving Using Elimination

Ex. 3) $3x - 10y = 14$
$\ 3x - 9y = 15$

Are the equations lined up?
Do x or y have matching coefficients?
Eliminate x or y?
Are the signs the same or different?
Add or subtract?

$$(-) \begin{array}{r} 3x - 10y = 14 \\ 3x - 9y = 15 \end{array}$$
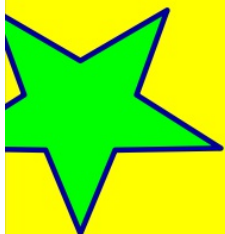
$$\frac{-y}{-1} = \frac{-1}{-1}$$

$$y = 1$$

$$(8, 1)$$

$$3x - 9(1) = 15$$
$$3x - 9 = 15$$
$$3x = 24$$
$$x = 8$$
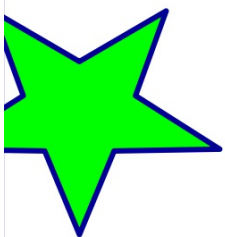
Solving Using Elimination

Are the equations lined up?
Do x or y have matching coefficients?
Are the signs the same or different?
Add or subtract?

$$4(-2) + 2y = 6$$
$$-8 + 2y = 6$$
$$2y = 14$$
$$y = 7$$

$(-)$ $\quad$ 4x + 2y = 6
$\quad\quad$ -2x + 2y = 18

$$6x = -12$$
$$\frac{6x}{6} = \frac{-12}{6}$$
$$x = -2$$

$$(-2, 7)$$

MORE PRACTICE WITH ELIMINATION

QUESTION: What do you do if there are no matching coefficients?

ANSWER: Multiply one or both equations by a number to create matching coefficients.

1. $x + 3y = 6$
$2x - 7y = -1$

$$2(x + 3y = 6) \rightarrow 2x + 6y = 12$$
$$(-) \quad 2x - 7y = -1$$

$$\frac{13y}{13} = \frac{13}{13}$$

$$y = 1$$

$$x + 3(1) = 6$$
$$x + 3 = 6$$
$$x = 3$$

$$(3, 1)$$

2. $9x + 3y = 12$

$2x + y = 5$

$4(3x - y = 14)$

3. $3x - y = 14$

$5x + 4y = 12$

$3(4) - y = 14$

$12 - y = 14$

$-12 \quad -12$

$-y = 2$

$\overline{-1} \quad \overline{-1}$

$y = -2$

$(4, -2)$

$\begin{array}{r} + \quad 12x - 4y = 56 \\ 5x + 4y = 12 \\ \hline 17x = 68 \\ \overline{17} \quad \overline{17} \end{array}$

$x = 4$

4. $x + y = -3$
   $5x - 2y = -50$

5. $3x - 3y = -3$
   $2x - y = -5$

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

$(-)$

$6x - 6y = -6$
$6x - 3y = -15$

$\dfrac{-3y}{-3} = \dfrac{9}{-3}$

$y = -3$

$2x - (-3) = -5$
$2x + 3 = -5$
$2x = -8$
$x = -4$

$(-4, -3)$