

Name: Key
Mrs. Roubos

$$\begin{array}{r} 5 \\ + -5 \\ \hline 0 \end{array} \quad \begin{array}{r} -2 \\ + 2 \\ \hline 0 \end{array}$$

Date: _____
8R Period _____

#76

Solving Systems of Equations Algebraically (Day III) using the Elimination Method

(Addition Method)

* The goal is to eliminate one of the variables

* Like terms **MUST** be lined up under one another

- I. Steps:
- 1) Decide which variable will be easier to eliminate. In order to eliminate a variable, the coefficients must be **additive inverses** of one another. *opposite 5 → -5, -2 → 2*
 - 2) If the coefficients are **not additive inverses** you must make them into opposites. *By multiplying/Distributing*
 - 3) Add the like terms
 - 4) Solve the remaining equation.
 - 5) Plug your answer into either **original equation** to get the second missing variable.
 - 6) Do **two checks** by substituting both answers into both equations.

II. Examples: Solve the following system of linear equations algebraically and check your solution.

1) $\begin{array}{r} 4x + 8y = 20 \\ + -4x + 2y = -30 \\ \hline \end{array}$

$$\frac{10y}{10} = \frac{-10}{10}$$

$y = -1$

$4x + 8y = 20$
 $4x + 8(-1) = 20$

$$\begin{array}{r} 4x - 8 = 20 \\ + 8 \quad + 8 \\ \hline 4x = 28 \\ \frac{4x}{4} = \frac{28}{4} \\ x = 7 \end{array}$$

$(7, -1)$

Original
chk#1 $(7, -1)$

$$\begin{array}{r} 4x + 8y = 20 \\ 4(7) + 8(-1) = 20 \\ 28 - 8 = 20 \\ 20 = 20 \end{array}$$

chk#2

$$\begin{array}{r} -4x + 2y = -30 \\ -4(7) + 2(-1) = -30 \\ -28 - 2 = -30 \\ -30 = -30 \end{array}$$

2) $\begin{array}{r} 3a + 4b = 2 \\ + 4a - 4b = 12 \\ \hline \end{array}$

$$\frac{7a}{7} = \frac{14}{7}$$

$a = 2$

$3a + 4b = 2$
 $3(2) + 4b = 2$

$$\begin{array}{r} 6 + 4b = 2 \\ -6 \quad -6 \\ \hline 4b = -4 \\ \frac{4b}{4} = \frac{-4}{4} \\ b = -1 \end{array}$$

$(2, -1)$

chk#1 $(2, -1)$

$$\begin{array}{r} 3a + 4b = 2 \\ 3(2) + 4(-1) = 2 \\ 6 - 4 = 2 \\ 2 = 2 \end{array}$$

chk#2

$$\begin{array}{r} 4a - 4b = 12 \\ 4(2) - 4(-1) = 12 \\ 8 + 4 = 12 \\ 12 = 12 \end{array}$$

3) $\begin{array}{r} 5x - y = -6 \\ + -x + y = 2 \\ \hline \end{array}$

$$\frac{4x}{4} = \frac{-4}{4}$$

$x = -1$

$5x - y = -6$
 $5(-1) - y = -6$

$$\begin{array}{r} -5 - y = -6 \\ + 5 \quad + 5 \\ \hline -y = -1 \\ \frac{-y}{-1} = \frac{-1}{-1} \\ y = 1 \end{array}$$

$(-1, 1)$

chk#1

$$\begin{array}{r} 5x - y = -6 \\ 5(-1) - (1) = -6 \\ -5 - 1 = -6 \\ -6 = -6 \end{array}$$

chk#2

$$\begin{array}{r} -x + y = 2 \\ -(-1) + 1 = 2 \\ 1 + 1 = 2 \\ 2 = 2 \end{array}$$

4) $5 \cdot (4x + 3y = -1)$
 $-4 \cdot (5x + 4y = 1)$

↑
 must add negative to make them inverses

$$\begin{array}{r} 20x + 15y = -5 \\ -20x - 16y = -4 \\ \hline -1y = -9 \\ \hline y = 9 \end{array}$$

$$\boxed{(-7, 9)}$$

original equation

$$\begin{array}{r} 4x + 3y = -1 \\ 4x + 3(9) = -1 \\ 4x + 27 = -1 \\ -27 -27 \\ \hline 4x = -28 \\ \frac{4x}{4} = \frac{-28}{4} \\ \hline x = -7 \end{array}$$

original equation

check #1

$$\begin{array}{r} 4x + 3y = -1 \\ 4(-7) + 3(9) = -1 \\ -28 + 27 = -1 \\ -1 = -1 \end{array}$$

original equation

check #2

$$\begin{array}{r} 5x + 4y = 1 \\ 5(-7) + 4(9) = 1 \\ -35 + 36 = 1 \\ 1 = 1 \end{array}$$

5) $2(4x - y = 10)$
 $-4(3x + 3y = 12)$

↑
 must add negative sign to make them inverses

$$\begin{array}{r} 8x - 2y = 20 \\ -12x - 12y = -48 \\ \hline -4y = -28 \\ \frac{-4y}{-4} = \frac{-28}{-4} \\ \hline y = 2 \end{array}$$

$$\boxed{(3, 2)}$$

original equation

$$\begin{array}{r} 4x - y = 10 \\ 4x - (2) = 10 \\ 4x - 2 = 10 \\ +2 +2 \\ \hline 4x = 12 \\ \frac{4x}{4} = \frac{12}{4} \\ \hline x = 3 \end{array}$$

original equation

check #1

$$\begin{array}{r} 4x - y = 10 \\ 4(3) - 2 = 10 \\ 12 - 2 = 10 \\ 10 = 10 \end{array}$$

original equation

check #2

$$\begin{array}{r} 2x + 3y = 12 \\ 2(3) + 3(2) = 12 \\ 6 + 6 = 12 \\ 12 = 12 \end{array}$$

don't put a negative on the outside B/C there is already one on the inside (on the -2)

bring up abs. value of -2

6) $2(3x - 2y = 22)$
 $3(-2x - 5y = -2)$

$$\begin{array}{r} 6x - 4y = 44 \\ -6x - 15y = -6 \\ \hline -19y = 38 \\ \frac{-19y}{-19} = \frac{38}{-19} \\ \hline y = -2 \end{array}$$

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

original equation

$$\begin{array}{r} 3x - 2y = 22 \\ 3x - 2(-2) = 22 \\ 3x + 4 = 22 \\ -4 -4 \\ \hline 3x = 18 \\ \frac{3x}{3} = \frac{18}{3} \\ \hline x = 6 \end{array}$$

original equation

check #1

$$\begin{array}{r} 3x - 2y = 22 \\ 3(6) - 2(-2) = 22 \\ 18 + 4 = 22 \\ 22 = 22 \end{array}$$

original equation

check #2

$$\begin{array}{r} -2x - 5y = -2 \\ -2(6) - 5(-2) = -2 \\ -12 + 10 = -2 \\ -2 = -2 \end{array}$$