7.3 Solve Linear Systems by Adding or Subtracting

Goal • Solve linear systems using elimination.

Your Notes

SOLVING A LINEAR SYSTEM USING THE ELIMINATION METHOD

Step 1 Add or subtract the equations to eliminate one variable.

Step 2 Solve the resulting equation for the other variable.

Step 3 **Substitute** in either original equation to find the value of the eliminated variable.

Example 1 *Use addition to eliminate a variable*

Solve the linear system: $x + 5y = 9$ **Equation 1**

$4x - 5y = -14$ **Equation 2**

Solution

1. Add the equations to eliminate one variable.

$$x + 5y = 9$$
$$4x - 5y = -14$$
$$5x \quad = \quad -5$$

2. **Solve** for x. $\qquad x = -1$

3. **Substitute** -1 for x in either equation and solve for y.

$x + 5y = 9$ Write Equation 1.

$-1 + 5y = 9$ Substitute -1 for x.

$y = 2$ Solve for y.

> Make sure to check your solution by substituting it into each of the original equations.

The solution is (-1 , 2).

Your Notes

Example 2 *Use subtraction to eliminate a variable*

Solve the linear system: $3x - 4y = 2$ **Equation 1**

$3x + 2y = 26$ **Equation 2**

Solution

1. <u>Subtract</u> the equations $3x - 4y = 2$
   to eliminate one variable. $\underline{3x + 2y = 26}$

$$\underline{-6y} = \underline{-24}$$

2. **Solve** for *y*. $y = \underline{4}$

3. **Substitute** $\underline{4}$ for *y* in either equation and <u>solve for *x*</u>.

$3x + 2y = 26$ **Write Equation 2.**

$3x + 2(\underline{4}) = 26$ **Substitute** $\underline{4}$ for *y*.

$x = \underline{6}$ **Solve for *x*.**

The solution is ($\underline{6}$, $\underline{4}$).

✔ *Checkpoint* **Solve the linear system.**

1. $-8x + 3y = 12$	**2.** $x + 6y = 13$
$8x - 9y = 12$	$-2x + 6y = -8$
$(-3, -4)$	$(7, 1)$

Example 3   *Arrange like terms*

Solve the linear system: $6x + 7y = 16$ **Equation 1**

$y = 6x - 32$ **Equation 2**

Solution

1. <u>Rewrite</u> Equation 2 so that the like terms are arranged in columns.

$$6x + 7y = 16 \qquad\qquad 6x + 7y = 16$$
$$y = 6x - 32 \qquad\qquad \underline{-6x + y = -32}$$

2. <u>Add</u> the equations. $\underline{8y} = \underline{-16}$

3. **Solve** for y. $y = \underline{-2}$

4. **Substitute** $\underline{-2}$ for y in either equation and <u>solve for x</u>.

$$6x + 7y = 16 \qquad \text{Write Equation 1.}$$
$$6x + 7(\underline{-2}) = 16 \qquad \text{Substitute } \underline{-2} \text{ for } y.$$
$$x = \underline{5} \qquad \underline{\text{Solve for } x}.$$

The solution is ($\underline{5}$, $\underline{-2}$).

✔ *Checkpoint* **Solve the linear system.**

3. $4x - 5y = 5$	**4.** $7y = 4 - 2x$
$5y = x + 10$	$2x + y = -8$
$(5, 3)$	$(-5, 2)$

Homework