7.5 Solve Special Types of Linear Systems

Goal • Identify the number of solutions of a linear system.

Your Notes

VOCABULARY

Inconsistent system A linear system with no solutions

Consistent dependent system A linear system with infinitely many solutions

Example 1 *A linear system with no solutions*

Show that the linear system has no solution.

$-2x + y = 1$ **Equation 1**

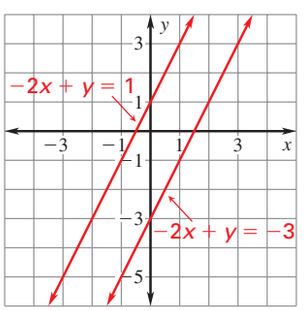
$-2x + y = -3$ **Equation 2**

To ease graphing, write each equation in slope intercept form.

Solution

Method 1 Graphing

Graph the linear system.



The lines are parallel because they have the same slope but different *y*-intercepts. Parallel lines do not intersect, so the system has no solution.

Method 2 Elimination

Subtract the equations.

$$\begin{array}{r} -2x + y = 1 \\ -2x + y = -3 \\ \hline 0 = 4 \end{array}$$

The variables are eliminated and you are left with a false statement regardless of the values of x and y. This tells you that the system has no solution.

Your Notes

Example 2 ***A linear system with infinitely many solutions***

Show that the linear system has infinitely many solutions.

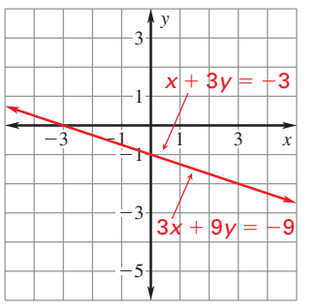
$x + 3y = -3$ **Equation 1**

$3x + 9y = -9$ **Equation 2**

Solution

Method 1 Graphing

Graph the linear system.



The equations represent the same line, so any point on the line is a solution. So, the linear system has infinitely many solutions.

Method 2 Substitution

$x =$ $-3y - 3$	**Solve Equation 1 for *x*.**
$3x + 9y = -9$	**Write Equation 2.**
$3($ $3y - 3$ $) + 9y = -9$	**Substitute** $-3y - 3$ **for *x*.**
$-9y - 9 + 9y = -9$	**Distributive property**
$-9 = -9$	**Simplify.**

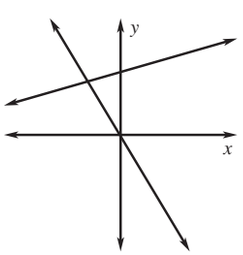
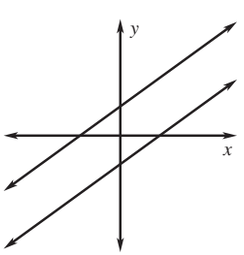
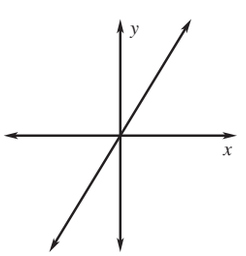
The variables are eliminated and you are left with a statement that is true regardless of the values of x and y. This tells you that the system has infinitely many solutions.

Your Notes

✔ ***Checkpoint*** **Tell whether the linear system has no solution or infinitely many solutions.**

1. $y = 2x - 7$ $4x - 2y = 14$ infinitely many solutions	**2.** $2y = 8x + 4$ $-4x + y = 4$ no solution

NUMBER OF SOLUTIONS OF A LINEAR SYSTEM

One solution	No solution	Infinitely many solutions
		
The lines intersect. The lines have different slopes.	The lines are parallel. The lines have the same slope and different *y*-intercepts.	The lines coincide. The lines have the same slope and the same *y*-intercept.

Homework