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 solution

Consistent dependent system A linear system with infinitely many solutions

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Systems have 3 Type of Solutions:
1) One Solution: 2 LINES THAT INTERSECT AT ONE POINT.
2) No Solution: ARE PARALLEL LINES
3) Infinite Solutions ARE THE SAME LINE

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

Solution

Method 1 Graphing

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

Graph the linear system.

The lines are _____ because they have the same slope but different y-intercepts. Parallel lines do _____, so the system has _____.
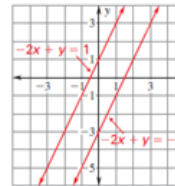
SOLUTION TO THIS SYSTEM:

NO SOLUTION

Method 2 Elimination

Subtract the equations.

$$-2x + y = 1$$
$$-2x + y = -3$$
$$\underline{\quad 0 = 4 \quad}$$

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*
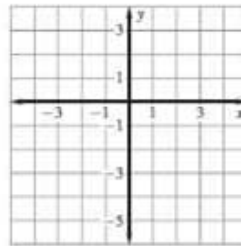>
> Show that the linear system has infinitely many solutions.
>
> $x + 3y = -3$ Equation 1
>
> $3x + 9y = -9$ Equation 2
>
> **Solution**
>
> Method 1   Graphing
>
> Graph the linear system. The equations represent the _____, so any point on the line is a solution. So, the linear system has _____.

Your Notes

EQ1

$$X + 3y = -3$$
$$-X \qquad\qquad -X$$

$$\frac{3y}{3} = \frac{-1X}{3} - \frac{3}{3}$$

$$\boxed{y = \tfrac{1}{3}X - 1}$$

EQ2 $\dfrac{9y}{9} = \dfrac{-3x}{9} - \dfrac{9}{9}$

$$\boxed{y = \tfrac{-1}{3}X - 1}$$

> **Example 2**   *A linear system with infinitely many solutions*
>
> Show that the linear system has infinitely many solutions.
>
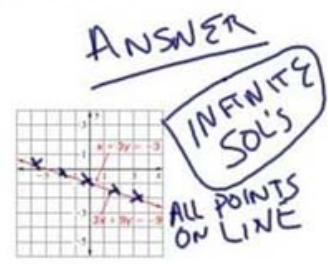> $x + 3y = -3$ Equation 1
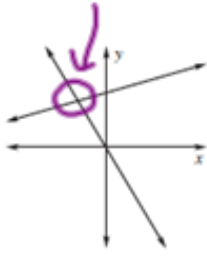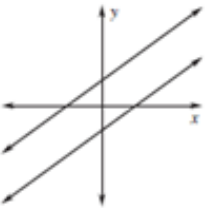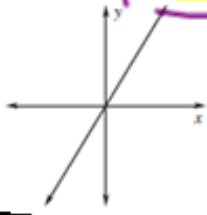>
> $3x + 9y = -9$ Equation 2
>
> **Solution**
>
> Method 1   Graphing
>
> Graph the linear system. The equations represent the _same line_, so any point on the line is a solution. So, the linear system has _infinitely many solutions_.

ANSWER

INFINITE SOL'S

ALL POINTS ON LINE

NUMBER OF SOLUTIONS OF A LINEAR SYSTEM

One solution   No solution   Infinitely many solutions ∞ 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 have
the same slope
and the _same_
y-intercept.