7.5 Solve Special Types of Linear Systems

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

Your Notes

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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

VOCABULARY

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

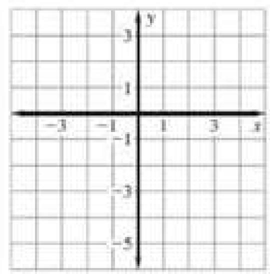
To ease graphing, write each equation in slope intercept form.

Solution

Method 1 Graphing

Graph the linear system.

The lines are ________ because they have the same slope but different y-intercepts. Parallel lines do __________, so the system has __________.



Example 1 *A linear system with no solutions*

Show that the linear system has no solution.

$-2x + y = 1$ Equation 1 $\Rightarrow y = 2x + 1$

$-2x + y = -3$ Equation 2 $\Rightarrow y = 2x - 3$

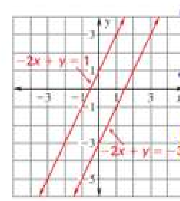
To ease graphing, write each equation in slope intercept form.

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.



Solution to this system: $\boxed{\text{NO SOLUTION}}$

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**

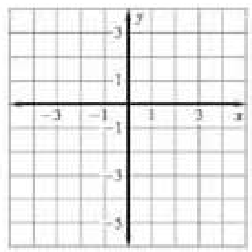
Solution

Method 1 Graphing

Graph the linear system.

The equations represent the ____________, so any point on the line is a solution.

So, the linear system has ____________________.



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**

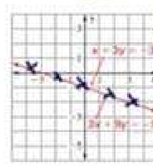
Solution

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.



EQ1

$$x + 3y = -3$$
$$-x \qquad -x$$
$$\frac{3y}{3} = \frac{-1x}{3} - \frac{3}{3}$$
$$y = -\tfrac{1}{3}x - 1$$

EQ2

$$\frac{9y}{9} = \frac{-3x}{9} - \frac{9}{9}$$
$$y = -\tfrac{1}{3}x - 1$$

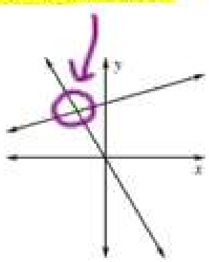
ANSWER

INFINITE SOL'S

ALL POINTS ON LINE

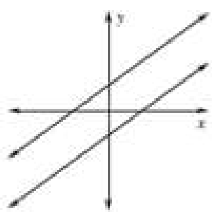
NUMBER OF SOLUTIONS OF A LINEAR SYSTEM

One solution



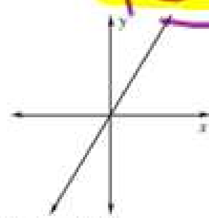
The lines intersect. The lines have different slopes.

No solution



The lines are parallel. The lines have the same slope and different y-intercepts.

Infinitely many solutions $\boxed{\infty \text{ SOLUTIONS}}$



[redacted] The lines have the same slope and the same y-intercept.