Solving 2 x 2 Systems of Linear Equations

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Preliminaries and Objectives

Preliminaries

- Graphs of Lines
- Algebraic Skills
  - Distributive Law
  - Combining Like Terms
  - Solving Linear Equations

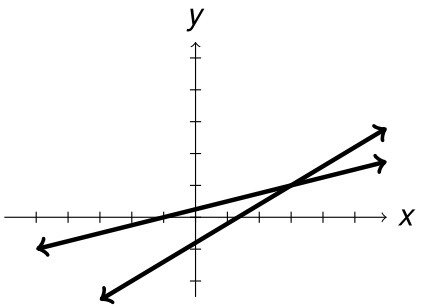
Objectives

- Determine if two lines intersect
- Find the intersection of two lines

Intersecting Lines

$$3x - 5y = 4$$

$$x = 4y - 1$$



Substitution Method

$$3x - 5y = 4$$
$$x = 4y - 1$$

$$3(4y - 1) - 5y = 4$$

$$12y - 3 - 5y = 4$$

$$7y = 7$$

$$y = 1$$

$$x = 4(1) - 1 = 3$$

Examples

$2x - 3y = -8$

$8 = 4y$

$x = -1, \quad y = 2$

$5x - y = 3$

$3x + 2y = 20$

$x = 2, \quad y = 7$

Elimination Method

$3x - 4y = -3$
$5x + 2y = 21$ multiply by 2

$$\begin{array}{rcl} 3x - 4y & = & -3 \\ 10x + 4y & = & 42 \\ \hline 13x & = & 39 \end{array}$$

$x = 3, \quad y = 3$

Inconsistent Systems

$2x - y = 7$
$-4x + 2y = 6$

$2x - y = 7$
$-2x + y = 3$

$0 = 10$

No solutions

Dependent Systems

$2x - y = 7$
$4x - 2y = 14$

$-4x + 2y = -14$
$4x - 2y = 14$

$0 = 0$

Infinitely many solutions, the lines are the same line.

Solutions to a 2x2 System of Linear Equations

Solutions to Equations	Graph	Call the solutions
One x-value and one y-value	Lines Intersect	Consistent and Independent
False Statement	Parallel Lines	Inconsistent
True Statement	Overlapping Lines	Dependent