

Sept. 26

Exploring Linear Systems

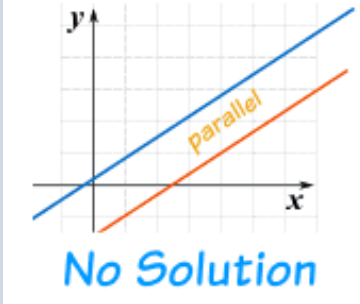
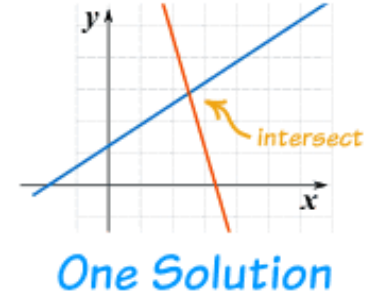
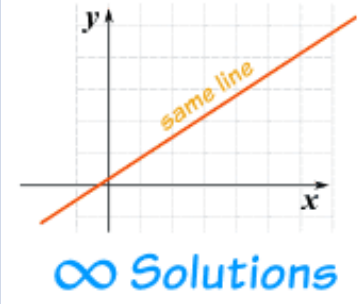
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Learning Goal

- Connect the number of solutions to a linear system with its equations and graphs.

Big Ideas

- A linear system can have no solution, one solution, or an infinite number of solutions.

	No Solution	One Solution	Infinite Number of Solutions
Graph	 <p>No Solution</p>	 <p>One Solution</p>	 <p>∞ Solutions</p>
Equations	Slopes are the same. Y-intercepts are different.	Slopes are different.	Slopes are the same. Y-intercepts are the same.
Example	$y = x$ $y = x - 2$	$y = \frac{3}{4}x + 1$ $y = -4x + 13$	$y = \frac{2}{3}x$ $2x - 3y = 0$

Example

- Predict the number of solutions for each linear system.

$$\begin{cases} y = 3x - 5 \\ y = 4x + 6 \end{cases}$$

$$m = 3, m = 4$$

\therefore 1 solution
lines intersect
at 1 point.

$$\begin{cases} \textcircled{1} 2x + 3y = 10 \\ \textcircled{2} 10x + 15y = 50 \end{cases}$$

$$\begin{aligned} \textcircled{1} \quad 2x + 3y &= 10 \\ 3y &= -2x + 10 \\ y &= -\frac{2}{3}x + \frac{10}{3} \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad 10x + 15y &= 50 \\ 15y &= -10x + 50 \\ y &= -\frac{10}{15}x + \frac{50}{15} \\ y &= -\frac{2}{3}x + \frac{10}{3} \end{aligned}$$

\therefore Infinite # of solutions
Same line.

$$\begin{cases} \textcircled{1} x + 2y = 10 \\ \textcircled{2} y = 8 - 0.5x \end{cases}$$

$$\begin{aligned} \textcircled{1} \quad x + 2y &= 10 \\ 2y &= -x + 10 \\ y &= -\frac{1}{2}x + 5 \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad y &= 8 - 0.5x \\ y &= -0.5x + 8 \end{aligned}$$

\therefore No solution
Parallel lines.

Consolidation

- Create a system of linear equations that has each number of solutions.

– None

$$y = 2x + 8$$
$$y = 2x - 8$$

– One

$$y = 2x + 5$$
$$y = x + 1$$

– Infinitely many

$$y = 8x + 5$$
$$y = 8x + 5$$

Reinforcement

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– #2, 6

Quiz tomorrow – 1 substitution

Review – Tuesday, Wednesday
Test – Thursday
elimination

More Elimination

Example: Use elimination to solve the system

$$\textcircled{1} \quad 3x - 5y = -21 \quad \textcircled{1} \times 3 \quad 9x - 15y = -63$$

$$\textcircled{2} \quad 4y + 9x = -6 \quad \underline{9x + 4y = -6}$$

subtract

$$-19y = -57$$

$$\underline{-19y = -57}$$

$$\boxed{y = 3}$$

sub $y = 3$ into $\textcircled{2}$

$$4y + 9x = -6$$

$$4(3) + 9x = -6$$

$$12 + 9x = -6$$

$$9x = -6 - 12$$

$$9x = -18$$

$$x = -18/9$$

$$\boxed{x = -2}$$

P.O.I.

$$(-2, 3)$$

Solve the system using
elimination:

$$\textcircled{1} \quad 5x + 2y = 18 \quad \textcircled{1} \times 2 \quad 10x + 4y = 36$$

$$\textcircled{2} \quad 2x + 3y = 16 \quad \textcircled{2} \times 5 \quad \underline{10x + 15y = 80}$$

subtract $-11y = -44$

$$-11y = -44$$

$$y = \frac{-44}{-11}$$

$$\boxed{y = 4}$$

subst.

$$y = 4 \text{ into } \textcircled{1}$$

$$5x + 2y = 18$$

$$5x + 2(4) = 18$$

$$5x + 8 = 18$$

$$5x = 18 - 8$$

$$5x = 10$$

$$x = \frac{10}{5}$$

$$\boxed{x = 2}$$

\therefore P.O.I.

$$(2, 4)$$