

## Systems of Equations

8/26/15

A **system of equations** is a set of two or more equations containing two or more variables. A **linear system** is a system of equations containing only linear equations.

On the graph of the system of two equations, the solution is the set of points where the lines intersect.

**Two methods for solving algebraically:**  
Substitution and Elimination

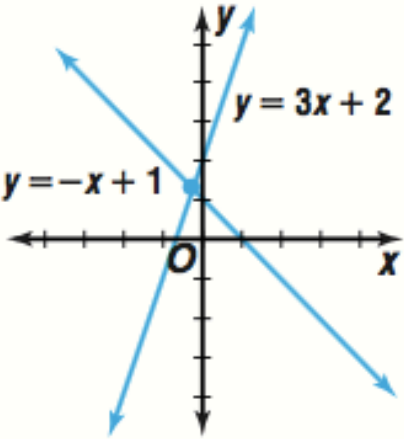
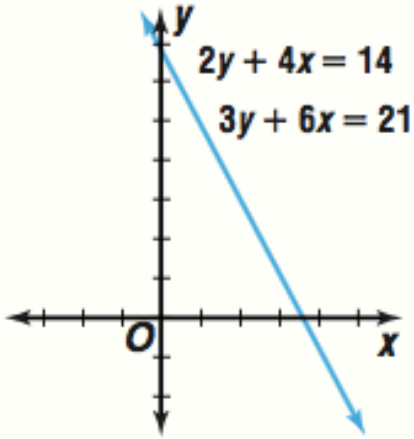
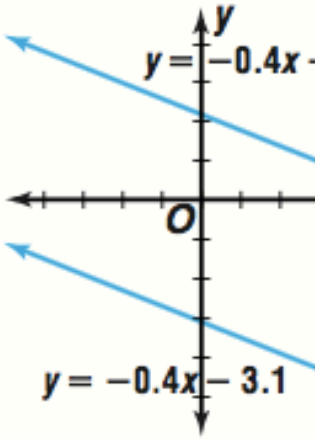
A **Consistent system** is a set of equation or inequalities that has at least one solution.

An **Inconsistent system** will have no solutions.  
Parallel lines

An **Independent system** has equations with different slopes.

A **Dependent system** has equations with equal slopes and equal y-intercepts.

## Same lines

consistent		inconsistent
independent	dependent	
		
$y = 3x + 2$ $y = -x + 1$	$2y + 4x = 14 \rightarrow y = -2x + 7$ $3y + 6x = 21 \rightarrow y = -2x + 7$	$y = -0.4x + 2$ $y = -0.4x - 3.1$
different slope	same slope, same intercept	same slope, different intercept
Lines intersect.	Graphs are same line.	Lines are parallel
one solution	infinitely many solutions	no solution

Example #1: Solve the system using substitution.

$$y + 2 = x$$

$$2x - 3y = 3$$

Substitute	$y + 2 = x$ $2x - 3y = 3$ $2(y + 2) - 3y = 3$
Simplify	$2y + 4 - 3y = 3$ $-y + 4 = 3$ $-y = -1$ $y = 1$
Plug in the value to solve for the other variable	$y + 2 = x$ $1 + 2 = x$ $3 = x$
	$(3, 1)$

We Try: Use substitution to solve:

$$2y + x = 4$$

$$3x - 4y = 7$$

Substitute	
Simplify	
Plug in the value to solve for the other variable	

You Try on the whiteboards:

$$0 = 4y + 10 - x$$

$$4x + 2y = 4$$

Example #2: Use the **elimination method** to solve the system.

$$3x + 2y = 4$$

$$2x - y = -9$$

Line up the variables	$3x + 2y = 4$ $2x - y = -9$
Multiply a row so that you can cancel a variable out.	$3x + 2y = 4$ $2(2x - y = -9)$ $3x + 2y = 4$ $+4x - 2y = -18$
Combine by addition or subtraction	$3x + 2y = 4$ $+4x - 2y = -18$
Simplify	$3x + 2y = 4$ $+4x - 2y = -18$ <hr/> $7x + 0y = -14$ $7x = -14$

	$x = -2$
Plug in the value to solve for the other variable	$3x + 2y = 4$ $3(-2) + 2y = 4$ $-6 + 2y = 4$ $2y = 10$ $y = 5$ $(-2, 5)$

We try

$$1.4x + 2y = 20$$

$$-5y + 2.5x = -25$$

Line up the variables	
Multiply a row so that you can cancel a variable out.	
Combine by addition or subtraction	

Simplify	
Plug in the value to solve for the other variable	

You Try on the whiteboards:

Solve the system

$$2x + 5y = 4$$

$$3x + 6y = 5$$