Solving Linear Systems
Algebraically Using Substitution
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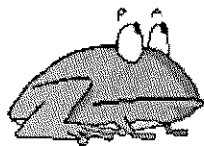
Solve this system of equations using substitution. Check.

$$3y - 2x = 11$$
$$y + 2x = 9$$

The substitution method is used to eliminate one of the variables by replacement when solving a system of equations.

Think of it as "grabbing" what one variable equals from one equation and "plugging" it into the other equation.

Systems of Equations may also be referred to as "simultaneous equations".

Let's look at an example using the substitution method:

Solve this system of equations (and check):	$3y - 2x = 11$ $y + 2x = 9$
1. Solve one of the equations for either "$x =$" or "$y =$". This example solves the second equation for "$y =$".	$3y - 2x = 11$ $y = 9 - 2x$
2. Replace the "y" value in the first equation by what "y" now equals. Grab the "y" value and plug it into the other equation.	$3(9 - 2x) - 2x = 11$
3. Solve this new equation for "x".	$(27 - 6x) - 2x = 11$ $27 - 6x - 2x = 11$

$$27 - 8x = 11$$
$$-8x = -16$$
$$x = 2$$

4. Place this new "x" value into either of the ORIGINAL equations in order to solve for "y". Pick the easier one to work with!

$$y + 2x = 9 \text{ or}$$
$$y = 9 - 2x$$
$$y = 9 - 2(2)$$
$$y = 9 - 4$$
$$y = 5$$

5. Check: substitute $x = 2$ and $y = 5$ into BOTH ORIGINAL equations. If these answers are correct, BOTH equations will be TRUE!

$$3y - 2x = 11$$
$$3(5) - 2(2) = 11$$
$$15 - 4 = 11$$
$$11 = 11 \text{ (check!)}$$

$$y + 2x = 9$$
$$5 + 2(2) = 9$$
$$5 + 4 = 9$$
$$9 = 9 \text{ (check!)}$$

Grab you Graphing Calculator:

Even though you are doing an "algebraic solution" you can still use your graphing calculator as a CHECK to be sure you have the correct answer. Click the calculator at the right for directions on using the TI-83+/84+ graphing calculator to solve systems of equations.

Click calculator.

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