Solving Linear Systems of Equations by Substitution

To Solve Systems of Two Linear Equations by Substitution

1. Solve one of the equations for one of the variables. (If one of the variables has a coefficient of 1 or –1, solve for it.)

2. Substitute the expression obtained in step 1 for that variable in the other equation, and solve the resulting equation in one variable.

    a. If this results in a value for one of the variables, substitute the value obtained for the variable into one of the *original* equations and solve for the other variable. There is one solution.

    b. If this results in the variables being eliminated and a true statement obtained, there are infinitely **many solutions** and the system is **dependent** (same line).

    c. If this results in the variables being eliminated and a false statement obtained, there is **no solution** and the system is **inconsistent** (parallel lines).

3. If the system has a solution is obtained in step 2a, check the solution in both equations.

Example: Solve by substitution $2x + 3y = 14$
$y = 3x + 1$

The second equation has already been solved for y.

Use this value, $3x + 1$, to substitute for y in the first equation.

$2x + 3 (3x+1) = 14$

Now solve for x.

$2x + 9x + 3 = 14$
$11x + 3 = 14$
$11x = 11$
$x = 1$ Now, substitute the value of 1 in for x in one of the equations.
$y = 3(1) + 1$
$y = 4$ Check the solution {(1,4)} in both of the original equations.

Solve by substitution:

$y = x + 2$
$x + y = 4$

$2x - 3y = 6$
$3y - 2x = 3$

$2(y + 2) = x$
$x - 2y = 4$

TRY:

$y = x + 4$
$3y - 5x = 6$

$x = y + 3$
$3x - 2y = 4$

$3y - x = 0$
$x - 4y = -2$

$2x - y = 4$
$2x - y = 3$