How Do You Solve a System of Equations by Substitution?

$3x + 2y = 10$
$2x - y = 9$

* Try to pick a variable with a coefficient of 1*

1st Choose one equation and solve for x or y.

$2x - y = 9$
$-2x \quad -2x$
$-y = -2x + 9$
$\frac{-y}{-1} = \frac{-2x}{-1} + \frac{9}{-1}$

$y = 2x - 9$

2nd Substitute the expression from that equation into the other equation and solve.

Substitute $2x-9$ into the 1st equation for y

$3x + 2(2x - 9) = 10$
$3x + 4x - 18 = 10$
$7x - 18 = 10$
$+18 \quad +18$

$\frac{7x}{7} = \frac{28}{7}$
$x = 4$

3rd Substitute the value found in step 2 back into the equation solved step one.

* Plug $x=4$ back into the equation from step 1 ($y=2x-9$) & solve for y*

$y = 2(4) - 9$
$= 8 - 9$
$y = -1$

SOLUTION $(4, -1)$

$-x + y = 7$

$2x - 2y = -18$

1st Choose one equation and solve for x or y.

$+x + y = 7$

$+x \qquad +x$

$y = x + 7$

2nd Substitute the expression from that equation into the other equation and solve.

$2x - 2(x+7) = -18$

$2x - 2x - 14 = -18$

$-14 = -18$

3rd Substitute the value found in step 2 back into the equation solved step one.

No solution

You Try It!

Problem:

$3x + y = -1$

$-9x - 3y = 3$

1st Choose one equation and solve for x or y.

$3x + y = -1$

$-3x \qquad -3x$

$y = -3x - 1$

2nd Substitute the expression from that equation into the other equation and solve.

$-9x - 3(-3x - 1) = 3$

$-9x + 9x + 3 = 3$

$3 = 3$

3rd Substitute the value found in step 2 back into the equation solved step one.

Solution: Infinite solutions