

# 4 Steps Substitution

- 1) Solve 1 of the equations for 1 of its variables.
- 2) Substitute step 1's expression into the other equation and solve for the variable.
- 3) Substitute the value from step 2 into the revised equation from step 1.
- 4) Check the solution in each of the original equations.

# \* Systems by Substitution

Ex: 1

$$\begin{array}{l} -x + y = 1 \\ 2x + y = -2 \end{array}$$

Pick 1

Step 1

$$-x + y = 1$$

$$\begin{array}{r} +x \qquad \qquad +x \\ \hline \end{array}$$

$$y = x + 1$$

Pick an Equation  
and solve for a  
variable.

Step 2

Sub - answer step 1 into the  
other equation

$$2x + y = -2$$

$$2x + (x + 1) = -2$$

$$3x + 1 = -2$$

$$\begin{array}{r} -1 \qquad -1 \\ \hline \end{array}$$

$$\begin{array}{r} 3x = -3 \\ \hline 3 \qquad 3 \end{array}$$

$$x = -1$$

Step 3

Sub - answer step 2 into  
answer from step 1.

Step 1 -  $y = x + 1$

$$y = -1 + 1$$

$$y = 0$$

**Step 4** - Check solution in each of original equations

**$(-1, 0)$**

$$-x + y = 1$$

$$2x + y = -2$$

$$-(-1) + 0 = 1$$

$$2(-1) + 0 = -2$$

$$1 + 0 = 1$$

$$-2 + 0 = -2$$

$$1 = 1$$

$$-2 = -2$$

**Ex: 2**

$$\begin{array}{l} 2x + 2y = 3 \\ \boxed{x - 4y = -1} \end{array}$$

**51**

$$\begin{array}{r} x - 4y = -1 \\ \quad + 4y \quad 4y \\ \hline \boxed{x = 4y - 1} \end{array}$$

**52**

$$2(4y - 1) + 2y = 3$$

$$8y - 2 + 2y = 3$$

$$\begin{array}{r} 10y - 2 = 3 \\ \quad + 2 \quad + 2 \\ \hline \end{array}$$

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

$$\boxed{y = \frac{1}{2}}$$

53  $y = \frac{1}{2}$   $x = 4y - 1$

$$x = 4\left(\frac{1}{2}\right) - 1$$

$$x = 2 - 1$$

$$x = 1$$

$(1, \frac{1}{2})$

$$2(1) + 2 \cdot \frac{1}{2} = 3$$

$$2 + 1 = 3$$

$$3 = 3$$

$$1 - 4 \cdot \frac{1}{2} = -1$$

$$1 - 2 = -1$$

$$-1 = -1$$

**EX: 3**  $\sqrt{3x + y = 5}$  ↗  
 $2x - y = 10$  ↘

**51**

$$\begin{array}{r} 3x + y = 5 \\ -3x \phantom{+ y} \\ \hline 0 \phantom{+ y} \end{array}$$

$$y = -3x + 5$$

**52**

$$2x - y = 10$$

$$2x - (-3x + 5) = 10$$

$$2x + 3x - 5 = 10$$

$$5x - 5 = 10$$

$$\begin{array}{r} +5 \phantom{=} +5 \\ \hline 0 \phantom{=} 15 \end{array}$$

$$\frac{5x}{5} = \frac{15}{5}$$

$$x = 3$$

**53**

$$y = -3(3) + 5$$

$$y = -9 + 5$$
$$y = -4$$

$$(3, -4)$$

$$\boxed{64} \quad 3(3) + -4 = 5$$

$$9 + -4 \downarrow \checkmark \checkmark$$
$$5 = 5$$

$$2(3) - -4 = 10$$

$$6 + 4$$

$$10 \checkmark = 10$$