

What you will learn about:
Solving Systems of Linear Equations by Substitution

Solving System of Equations by Substitution

Solve a system of equations by substitution.

- Step 1. Solve one of the equations for either variable.
- Step 2. Substitute the expression from Step 1 into the other equation.
- Step 3. Solve the resulting equation.
- Step 4. Substitute the solution in Step 3 into one of the original equations to find the other variable.
- Step 5. Write the solution as an ordered pair.
- Step 6. Check that the ordered pair is a solution to both original equations.

Solve the system by Substitution. $\begin{cases} 2x + y = 7 \\ x - 2y = 6 \end{cases}$

Solve for x in bottom equation

$$x - 2y = 6$$

$$x = 6 + 2y$$

$$x = 6 + 2(-1)$$

$$x = 4$$

$$(4, -1)$$

$$\begin{aligned} &\downarrow \\ &2(6+2y) + y = 7 \\ &12 + 4y + y = 7 \\ &12 + 5y = 7 \\ &5y = -5 \\ &y = -1 \end{aligned}$$

Solve the system by Substitution.

$$\begin{cases} -7x - 2y = -13 \\ x - 2y = 11 \Rightarrow x = 11 + 2y \end{cases}$$

$$-7(11 + 2y) - 2y = -13$$

$$-77 - 14y - 2y = -13$$

$$-77 - 16y = -13$$

$$-16y = 64$$

$$y = -4$$

$$\begin{aligned} x &= 11 + 2(-4) \\ &= 3 \end{aligned}$$

$$(3, -4)$$

Solve the system by Substitution.

$$\begin{cases} -5x + y = -3 \Rightarrow y = -3 + 5x \\ 3x - 8y = 24 \end{cases}$$

$$3x - 8(-3 + 5x) = 24$$

$$3x + 24 - 40x = 24$$

$$-37x + 24 = 24$$

$$y = -3 + 5(0)$$

$$y = -3$$

$$-37x = 0$$

$$x = 0$$

$$(0, -3)$$

$$\begin{array}{r} 79 \\ \underline{8} \\ 152 \\ 4 \\ \hline 43 \overline{)172} \\ \underline{172} \\ 0 \end{array}$$

Solve the system by Substitution.

$$\begin{cases} -3x - 8y = 20 \\ -5x + y = 19 \Rightarrow y = 19 + 5x \end{cases}$$

$$-3x - 8(19 + 5x) = 20$$

$$-3x - 152 - 40x = 20$$

$$-43x - 152 = 20$$

$$-43x = 172$$

$$x = -4$$

$$y = 19 + 5(-4)$$

$$y = 19 - 20$$

$$y = -1$$

$$(-4, -1)$$

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Solve the system by Substitution.

$$\begin{cases} -2x + 6y = 6 \Rightarrow -2x = 6 - 6y \\ -7x + 8y = -5 \end{cases}$$

$$-7(-3 + 3y) + 8y = -5$$

$$21 - 21y + 8y = -5$$

$$21 - 13y = -5$$

$$-13y = -26$$

$$y = 2$$

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

$$x = -3 + 6$$

$$x = 3$$

$$x = -3 + 3y$$

$$(3, 2)$$

Solve the system by Substitution.

$$\begin{cases} 2x + y = 7 \Rightarrow y = 7 - 2x \\ x - 2y = 6 \end{cases}$$

$$x - 2(7 - 2x) = 6$$

$$x - 14 + 4x = 6$$

$$5x - 14 = 6$$

$$5x = 20$$

$$x = 4$$

$$y = 7 - 2(4)$$

$$y = 7 - 8$$

$$y = -1$$

$$(4, -1)$$

$$\left(\frac{9}{4}, \frac{5}{2}\right)$$

Solve the system by Substitution.

$$\begin{cases} y = 6x - 11 \\ -2x - y = -7 \end{cases}$$

$$-2x - (6x - 11) = -7$$

$$-2x - 6x + 11 = -7$$

$$-8x = -18$$

$$x = \frac{18}{8} = \frac{9}{4}$$

$$y = 6\left(\frac{9}{4}\right) - 11$$

$$= \frac{54}{4} - \frac{44}{4}$$

$$= \frac{10}{4} = \frac{5}{2}$$

Solve the system by Substitution.

$$\begin{cases} y = -3x + 5 \\ 5x - 4y = -3 \end{cases}$$

$$5x - 4(-3x + 5) = -3$$

$$5x + 12x - 20 = -3$$

$$17x - 20 = -3$$

$$y = -3(1) + 5$$

$$= -3 + 5$$

$$= 2$$

$$17x = 17$$

$$x = 1$$

$$(1, 2)$$

Solve the system by Substitution. $\begin{cases} y = -2 \\ 4x - 3y = 18 \end{cases}$

$$4x - 3(-2) = 18$$

$$4x + 6 = 18 \quad (3, -2)$$

$$4x = 12$$

$$x = 3$$

Solve the system by Substitution. $\begin{cases} 2x + y = 7 \\ x - 2y = 6 \end{cases}$ $x = 6 + 2y$

$$2(6 + 2y) + y = 7$$

$$12 + 4y + y = 7$$

$$12 + 5y = 7$$

$$5y = -5$$

$$y = -1$$

$$x = 6 + 2(-1)$$

$$x = 4$$

$$(4, -1)$$

Solve the system by Substitution. $\begin{cases} y = 2x + 1 \\ y = -3x - 6 \end{cases}$

Solve the system by Substitution. $\begin{cases} y = -2x + 5 \\ y = \frac{1}{2}x \end{cases}$