

Solving Systems of Equations by Substitution

Solve each system by substitution.

1) $y = 7x - 10$

$$\begin{aligned} -3 &= 7(1) - 10 \\ -3 &= 7 - 10 \\ -3 &= -3 \checkmark \end{aligned}$$

$$\begin{aligned} y &= -3 \\ -3 &= 7x - 10 \\ 7 &= 7x \\ 1 &= x \end{aligned}$$

$(1, -3)$

2) $y = -8$
 $y = -2x - 12$

$$\begin{aligned} -8 &= -2(-2) - 12 \\ -8 &= 4 - 12 \\ -8 &= -8 \checkmark \end{aligned}$$

$$\begin{aligned} -8 &= -2x - 12 \\ +12 & \quad +12 \\ 4 &= -2x \end{aligned}$$

$$\begin{aligned} 4 &= -2x \\ \frac{4}{-2} & \quad \frac{-2}{-2} \\ -2 &= x \end{aligned}$$

$(-2, -8)$

3) $y = 6x$

$$\begin{aligned} y &= 5x + 7 \\ \rightarrow 6x &= 5x + 7 \\ x &= 7 \end{aligned}$$

$$\begin{aligned} 42 &= 5(7) + 7 \\ 42 &= 35 + 7 \\ 42 &= 42 \checkmark \end{aligned}$$

$$\begin{aligned} y &= 6(7) \\ y &= 42 \end{aligned}$$

$(7, 42)$

$$\begin{aligned} 42 &= 6x \\ \frac{42}{6} & \quad \frac{6x}{6} \\ 7 &= x \end{aligned}$$

4) $y = 9x - 9$

$$\begin{aligned} y &= 9 \\ 9 &= 9x - 9 \\ 18 &= 9x \\ 2 &= x \end{aligned}$$

$$\begin{aligned} 9 &= 9(2) - 9 \\ 9 &= 18 - 9 \\ 9 &= 9 \checkmark \end{aligned}$$

$(2, 9)$

5) $y = -4$

$$\begin{aligned} y &= x - 8 \\ -4 &= x - 8 \\ +8 & \quad +8 \\ 4 &= x \end{aligned}$$

$$\begin{aligned} -4 &= 4 - 8 \\ -4 &= -4 \checkmark \end{aligned}$$

6) $y = 8x - 9$

$$\begin{aligned} y &= 7 \\ 7 &= 8x - 9 \\ +9 & \quad +9 \\ 16 &= 8x \\ 2 &= x \end{aligned}$$

$$\begin{aligned} 7 &= 8(2) - 9 \\ 7 &= 16 - 9 \\ 7 &= 7 \checkmark \end{aligned}$$

$(2, 7)$

7) $y = 6x - 14$

$$\begin{aligned} y &= -8x \\ -8x &= 6x - 14 \\ -6x & \quad -6x \\ -14x &= -14 \end{aligned}$$

$$\begin{aligned} -8 &= 6(1) - 14 \\ -8 &= 6 - 14 \\ -8 &= -8 \checkmark \end{aligned}$$

$x = 1$

$$\begin{aligned} y &= -8(1) \\ y &= -8 \end{aligned}$$

$(1, -8)$

8) $y = 2x - 15$

$$\begin{aligned} y &= 5x \\ 5x &= 2x - 15 \\ 3x &= -15 \\ x &= -5 \end{aligned}$$

$$\begin{aligned} -25 &= 2(-5) - 15 \\ -25 &= -10 - 15 \\ -25 &= -25 \checkmark \end{aligned}$$

$$\begin{aligned} y &= 5(-5) \\ y &= -25 \end{aligned}$$

$(-5, -25)$

9) $y = -8x$
 $2x + 4y = 0$

$$2x + 4(-8x) = 0$$

$$2x - 32x = 0$$

$$-30x = 0$$

$$x = 0$$

$$y = -8(0)$$

$$y = 0$$

$$(0, 0)$$

$$2(0) + 4(0) = 0$$

$$0 + 0 = 0$$

$$0 = 0 \checkmark$$

10) $6x + 7y = 20$
 $y = 2x$

$$6x + 7(2x) = 20$$

$$6x + 14x = 20$$

$$20x = 20$$

$$x = 1$$

$$y = 2(1)$$

$$y = 2$$

$$(1, 2)$$

$$6(1) + 7(2) = 20$$

$$6 + 14 = 20$$

$$\checkmark 20 = 20$$

11) $-3x - 5y = 6$
 $y = -3$

$$-3x - 5(-3) = 6$$

$$-3x + 15 = 6$$

$$\begin{array}{r} -3x + 15 = 6 \\ -15 \quad -15 \\ \hline -3x = -9 \end{array}$$

$$x = 3$$

$$(3, -3)$$

$$-3(3) - 5(-3) = 6$$

$$-9 + 15 = 6$$

$$6 = 6 \checkmark$$

12) $6x - 5y = 22$
 $y = -8$

$$6x - 5(-8) = 22$$

$$6x + 40 = 22$$

$$\begin{array}{r} 6x + 40 = 22 \\ -40 \quad -40 \\ \hline 6x = -18 \end{array}$$

$$x = -3$$

$$(-3, -8)$$

$$6(-3) - 5(-8) = 22$$

$$-18 + 40 = 22$$

$$22 = 22 \checkmark$$

13) $y = 2x$
 $3x + 3y = -18$

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

$$3x + 6x = -18$$

$$9x = -18$$

$$x = -2$$

$$y = 2(-2)$$

$$y = -4$$

$$(-2, -4)$$

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

$$-6 + -12 = -18$$

$$-18 = -18 \checkmark$$

14) $y = 8x$
 $-5x - 5y = 0$

$$-5x - 5(8x) = 0$$

$$-5x - 40x = 0$$

$$-45x = 0$$

$$x = 0$$

$$y = 8(0)$$

$$y = 0$$

$$(0, 0)$$

$$-5(0) - 5(0) = 0$$

$$0 - 0 = 0$$

$$\checkmark 0 = 0$$

15) $y = -3$
 $-5x - 3y = 14$

$$-5x - 3(-3) = 14$$

$$-5x + 9 = 14$$

$$\begin{array}{r} -5x + 9 = 14 \\ -9 \quad -9 \\ \hline -5x = 5 \\ \frac{-5x}{-5} = \frac{5}{-5} \\ x = -1 \end{array}$$

$$(-1, -3)$$

$$-5(-1) - 3(-3) = 14$$

$$5 + 9 = 14$$

$$14 = 14 \checkmark$$

16) $y = 3x$
 $-3x - y = -24$

$$-3x - (3x) = -24$$

$$-6x = -24$$

$$x = 4$$

$$y = 3(4)$$

$$y = 12$$

$$(4, 12)$$

$$-3(4) - 12 = -24$$

$$-12 - 12 = -24$$

$$\checkmark -24 = -24$$