

Solving Systems of Equations by Substitution

Solve each system by substitution.

$$\begin{aligned} 1) \quad & y = 6x - 11 \\ & -2x - 3y = -7 \end{aligned}$$

$$\begin{aligned} 2) \quad & 2x - 3y = -1 \\ & y = x - 1 \end{aligned}$$

$$\begin{aligned} & 2x - 3(x - 1) = -1 \\ & 2x - 3x + 3 = -1 \\ & -x + 3 = -1 \\ & \quad -3 \quad -3 \\ & -x = -4 \\ & \boxed{x = 4} \end{aligned}$$

$$\begin{aligned} & y = (4) - 1 \\ & \boxed{y = 3} \\ & (4, 3) \end{aligned}$$

$$\begin{aligned} 3) \quad & y = -3x + 5 \\ & 5x - 4y = -3 \end{aligned}$$

$$\begin{aligned} 4) \quad & -3x - 3y = 3 \\ & y = -5x - 17 \end{aligned}$$

$$\begin{aligned} & -3x - 3(-5x - 17) = 3 \\ & -3x + 15x + 51 = 3 \\ & 12x + 51 = 3 \\ & \quad -51 \quad -51 \\ & 12x = -48 \\ & \frac{12x}{12} = \frac{-48}{12} \\ & \boxed{x = -4} \end{aligned}$$

$$\begin{aligned} & y = -5(-4) - 17 \\ & y = 20 - 17 \\ & \boxed{y = 3} \\ & (-4, 3) \end{aligned}$$

$$\begin{aligned} 5) \quad & y = -2 \\ & 4x - 3y = 18 \end{aligned}$$

$$\begin{aligned} 6) \quad & y = 5x - 7 \\ & -3x - 2y = -12 \end{aligned}$$

$$\begin{aligned} & -3x - 2(5x - 7) = -12 \\ & -3x - 10x + 14 = -12 \\ & -13x + 14 = -12 \\ & \quad -14 \quad -14 \\ & -13x = -26 \\ & \frac{-13x}{-13} = \frac{-26}{-13} \\ & \boxed{x = 2} \end{aligned}$$

$$\begin{aligned} & y = 5(2) - 7 \\ & y = 10 - 7 \\ & \boxed{y = 3} \\ & (2, 3) \end{aligned}$$

$$\begin{aligned} 7) \quad & -4x + y = 6 \\ & -5x - y = 21 \end{aligned}$$

$$\begin{aligned} 8) \quad & -7x - 2y = -13 \\ & x - 2y = 11 \end{aligned}$$

$$\begin{aligned} & x - 2y = 11 \\ & \quad + 2y + 2y \\ & \boxed{x} = \boxed{2y + 11} \end{aligned}$$

$$\begin{aligned} & -7(2y + 11) - 2y = -13 \\ & -14y - 77 - 2y = -13 \\ & -16y - 77 = -13 \\ & \quad + 77 \quad + 77 \\ & -16y = 64 \\ & \frac{-16y}{-16} = \frac{64}{-16} \\ & \boxed{y = -4} \end{aligned}$$

$$\begin{aligned} & x = 2(-4) + 11 \\ & x = -8 + 11 \\ & \boxed{x = 3} \quad (3, -4) \end{aligned}$$

$$\begin{aligned} 9) \quad & -5x + y = -2 \\ & -3x + 6y = -12 \end{aligned}$$

$$\begin{aligned} 10) \quad & -5x + y = -3 \\ & 3x - 8y = 24 \end{aligned}$$

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

$$\begin{aligned} & 3x - 8(-5x - 3) = 24 \\ & 3x - 40x + 24 = 24 \\ & \quad -24 \quad -24 \\ & -37x = 0 \\ & \frac{-37x}{-37} = \frac{0}{-37} \\ & \boxed{x = 0} \end{aligned}$$

$$\begin{aligned} & y = 5(0) - 3 \\ & y = 0 - 3 \\ & \boxed{y = -3} \\ & (0, -3) \end{aligned}$$

$$\begin{aligned} 11) \quad x + 3y &= 1 \\ -3x - 3y &= -15 \end{aligned}$$

$$\begin{aligned} 13) \quad -3x + 3y &= 4 \\ -x + y &= 3 \end{aligned}$$

$$\begin{aligned} 15) \quad 6x + 6y &= -6 \\ 5x + y &= -13 \end{aligned}$$

$$\begin{aligned} 17) \quad -3x - 4y &= 2 \\ 3x + 3y &= -3 \end{aligned}$$

$$\begin{aligned} 19) \quad -5x - 8y &= 17 \\ 2x - 7y &= -17 \end{aligned}$$

$$\begin{aligned} 12) \quad -3x - 8y &= 20 \\ -5x + y &= 19 \end{aligned}$$

$$\begin{array}{r} +5x \qquad +5x \\ \boxed{y} = \boxed{5x + 19} \end{array}$$

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

$$y = -20 + 19$$

$$\boxed{y = -1} \quad (-4, -1)$$

$$\begin{aligned} -3x - 8(5x + 19) &= 20 \\ -3x - 40x + 152 &= 20 \\ -43x - 152 &= 20 \\ +152 \quad +152 \\ -43x &= 172 \\ -43x &= \frac{172}{-43} \\ \boxed{x} &= \boxed{-4} \end{aligned}$$

$$\begin{aligned} 14) \quad -3x + 3y &= 3 \\ -5x + y &= 13 \end{aligned}$$

$$\begin{array}{r} +5x \qquad +5x \\ \boxed{y} = \boxed{5x + 13} \end{array}$$

$$y = 5(-3) + 13$$

$$y = -15 + 13$$

$$\boxed{y = -2} \quad (-3, -2)$$

$$\begin{aligned} -3x + 3(5x + 13) &= 3 \\ -3x + 15x + 39 &= 3 \\ 12x + 39 &= 3 \\ -39 \quad -39 \\ 12x &= -36 \\ \frac{12x}{12} &= \frac{-36}{12} \\ \boxed{x} &= \boxed{-3} \end{aligned}$$

$$\begin{aligned} 16) \quad 2x + y &= 20 \Rightarrow \boxed{y} = \boxed{2x + 20} \\ 6x - 5y &= 12 \end{aligned}$$

$$6x - 5(-2x + 20) = 12$$

$$6x + 10x - 100 = 12$$

$$16x - 100 = 12$$

$$\begin{array}{r} +100 \quad +100 \\ 16x = 112 \\ \frac{16x}{16} = \frac{112}{16} \end{array} \quad \boxed{x} = \boxed{7}$$

$$y = -2(7) + 20$$

$$y = -14 + 20$$

$$\boxed{y} = \boxed{6} \quad (7, 6)$$

$$\begin{aligned} 18) \quad -2x + 6y &= 6 \Rightarrow -2x + 6y = 6 \\ -7x + 8y &= -5 \end{aligned}$$

$$\begin{array}{r} -6y \quad -6y \\ -2x = -6y + 6 \\ \frac{-2x}{-2} = \frac{-6y + 6}{-2} \\ \boxed{x} = \boxed{3y - 3} \end{array}$$

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

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

$$-13y + 21 = -5$$

$$\begin{array}{r} -21 \quad -21 \\ -13y = -26 \\ \frac{-13y}{-13} = \frac{-26}{-13} \end{array} \quad \boxed{y} = \boxed{2}$$

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

$$x = 6 - 3$$

$$\boxed{x} = \boxed{3} \quad (3, 2)$$

$$\begin{aligned} 20) \quad -2x - y &= -9 \Rightarrow -2x - y = -9 \\ 5x - 2y &= 18 \end{aligned}$$

$$\begin{array}{r} +2x \qquad +2x \\ -y = 2x - 9 \\ \frac{-y}{-1} = \frac{2x - 9}{-1} \\ \boxed{y} = \boxed{-2x + 9} \end{array}$$

$$5x - 2(-2x + 9) = 18$$

$$5x + 4x - 18 = 18$$

$$9x - 18 = 18$$

$$\begin{array}{r} +18 \quad +18 \\ 9x = 36 \\ \frac{9x}{9} = \frac{36}{9} \end{array} \quad \boxed{x} = \boxed{4} \quad (4, 1)$$

$$y = -2(4) + 9$$

$$y = -8 + 9$$

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