

# Solve with Substitution 1-10

$$1. \begin{cases} y+11=6x \\ -2x-3y=-7 \end{cases} \rightarrow \begin{cases} y+11=6x \\ \underline{-11 \quad -11} \\ y=6x-11 \end{cases}$$

$$\begin{aligned} -2x-3y &= -7 \\ -2x-3(6x-11) &= -7 \\ -2x-18x+33 &= -7 \\ -20x+33 &= -7 \\ \underline{-33 \quad -33} \\ -20x &= -40 \\ \underline{-20 \quad -20} \\ x &= 2 \end{aligned}$$

$$\begin{aligned} y+11 &= 6x \\ y+11 &= 6(2) \\ y+11 &= 12 \\ \underline{-11 \quad -11} \\ y &= 1 \end{aligned}$$

**(2, 1)**

$$2. \begin{cases} 6x+by=-6 \\ 5x+y=-13 \end{cases} \rightarrow \begin{cases} 5x+y=-13 \\ \underline{-5x \quad -5x} \\ y=-5x-13 \end{cases}$$

$$\begin{aligned} 6x+b(-5x-13) &= -6 \\ 6x-30x-78 &= -6 \\ -24x-78 &= -6 \\ \underline{+78 \quad +78} \\ -24x &= 72 \\ \underline{-24 \quad -24} \\ x &= -3 \end{aligned}$$

$$\begin{aligned} 6x+by &= -6 \\ 6(-3)+by &= -6 \\ -18+by &= -6 \\ \underline{+18 \quad +18} \\ by &= 12 \\ \frac{by}{b} &= \frac{12}{b} \\ y &= 2 \end{aligned}$$

**(-3, 2)**

$$\begin{array}{r}
 3. \quad 3x + y = 5 \rightarrow 3x + y = 5 \\
 5x - 4y = -3 \quad \underline{-3x \quad -3x} \\
 \qquad \qquad \qquad y = -3x + 5
 \end{array}$$

$$\begin{array}{r}
 5x - 4(-3x + 5) = -3 \\
 5x + 12x - 20 = -3 \\
 \qquad \qquad \qquad +20 \quad +20 \\
 \hline
 17x = 17 \\
 \frac{17x}{17} = \frac{17}{17} \\
 x = 1
 \end{array}$$

$$\begin{array}{r}
 3x + y = 5 \\
 3(1) + y = 5 \\
 3 + y = 5 \\
 \qquad \qquad \underline{-3 \quad -3} \\
 \qquad \qquad \qquad y = 2
 \end{array}$$

(1, 2)

$$\begin{array}{r}
 4. \quad -3x + 3y = 4 \\
 -x + y = 3 \quad \rightarrow \quad \begin{array}{r} -x + y = 3 \\ \underline{+x \quad +x} \\ y = x + 3 \end{array}
 \end{array}$$

$$\begin{array}{r}
 -3x + 3y = 4 \\
 -3x + 3(x + 3) = 4 \\
 -3x + 3x + 9 = 4 \\
 \qquad \qquad \qquad 9 = 4
 \end{array}$$

untrue statement!  
Lines must be parallel

No Solution

Are lines parallel?

$$\begin{array}{r}
 -3x + 3y = 4 \\
 \underline{+3x \quad +3x} \\
 3y = \frac{3x}{3} + \frac{4}{3} \\
 y = x + \frac{4}{3}
 \end{array}$$

$$\begin{array}{r}
 -x + y = 3 \\
 \underline{+x \quad +x} \\
 y = x + 3
 \end{array}$$

Parallel lines, same slope different y-ints.

$$5. \quad \begin{array}{l} -3x - 3y = 3 \\ 5x + y = -17 \end{array} \rightarrow \begin{array}{r} 5x + y = -17 \\ -5x \quad -5x \\ \hline y = -5x - 17 \end{array}$$

$$\begin{array}{l} -3x - 3y = 3 \\ -3x - 3(-5x - 17) = 3 \\ -3x + 15x + 51 = 3 \\ 12x + 51 = 3 \\ \quad -51 \quad -51 \\ \hline 12x = -48 \\ \quad 12 \quad 12 \\ \hline x = -4 \end{array}$$

$$\begin{array}{l} 5x + y = -17 \\ 5(-4) + y = -17 \\ -20 + y = -17 \\ \quad +20 \quad +20 \\ \hline y = -3 \end{array}$$

$$(-4, -3)$$

$$6. \quad \begin{array}{l} x + 3y = 1 \\ 3x + 3y = 15 \end{array} \rightarrow \begin{array}{r} x + 3y = 1 \\ -3y \quad -3y \\ \hline x = -3y + 1 \end{array}$$

$$\begin{array}{l} 3x + 3y = 15 \\ 3(-3y + 1) + 3y = 15 \\ -9y + 3 + 3y = 15 \\ -6y + 3 = 15 \\ \quad -3 \quad -3 \\ \hline -6y = 12 \\ \quad -6 \quad -6 \\ \hline y = -2 \end{array}$$

$$\begin{array}{l} x + 3y = 1 \\ x + 3(-2) = 1 \\ x - 6 = 1 \\ \quad +6 \quad +6 \\ \hline x = 7 \end{array}$$

$$(7, -2)$$

7.

$$y = -2$$

$$4x - 3y = 18$$

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

$$4x + 6 = 18$$

$$\begin{array}{r} -6 \quad -6 \\ \hline \end{array}$$

$$4x = 12$$

$$\frac{4x}{4} = \frac{12}{4}$$

$$x = 3$$

$(3, -2)$

8.

$$2x + y = 20 \rightarrow 2x + y = 20$$

$$6x - 5y = 12$$

$$\begin{array}{r} -2x \quad -2x \\ \hline \end{array}$$

$$y = -2x + 20$$

$$6x - 5y = 12$$

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

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

$$16x - 100 = 12$$

$$\begin{array}{r} +100 \quad +100 \\ \hline \end{array}$$

$$16x = 112$$

$$\frac{16x}{16} = \frac{112}{16}$$

$$x = 7$$

$$2x + y = 20$$

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

$$14 + y = 20$$

$$\begin{array}{r} -14 \quad -14 \\ \hline \end{array}$$

$$y = 6$$

$(7, 6)$

$$9. \quad \begin{array}{l} -4x + y = 6 \\ -5x - y = 21 \end{array} \rightarrow \begin{array}{r} -4x + y = 6 \\ +4x \quad +4x \\ \hline y = 4x + 6 \end{array}$$

$$-5x - y = 21$$

$$-5x - (4x + 6) = 21$$

$$-5x - 4x - 6 = 21$$

$$-9x - 6 = 21$$

$$+6 \quad +6$$

$$\hline -9x = 27$$

$$\frac{-9}{-9} \quad \frac{27}{-9}$$

$$x = -3$$

$$-4x + y = 6$$

$$-4(-3) + y = 6$$

$$12 + y = 6$$

$$-12 \quad -12$$

$$\hline y = -6$$

$$(-3, -6)$$

$$10. \quad \begin{array}{l} -9x + y = -3 \\ 3x - 8y = 24 \end{array} \rightarrow \begin{array}{r} -9x + y = -3 \\ +5x \quad +5x \\ \hline y = 5x - 3 \end{array}$$

$$3x - 8y = 24$$

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

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

$$-37x + 24 = 24$$

$$-24 \quad -24$$

$$\hline -37x = 0$$

$$\frac{-37}{-37} \quad \frac{0}{-37}$$

$$x = 0$$

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

$$-9(0) + y = -3$$

$$y = -3$$

$$(0, -3)$$