

Sec. 6-2 Solving Systems Using Substitution

Solve using substitution.

$$a. \textcircled{1} \begin{cases} y = 5x \\ x + y = 12 \end{cases} \rightarrow \begin{cases} y = 5(2) \\ y = 10 \end{cases}$$

$$x + \boxed{y} = 12$$

$$x + 5x \textcircled{2} = 12$$

$$\frac{6x}{6} = \frac{12}{6}$$

$$\textcircled{3} x = 2$$

$$(2, 10)$$

① Solve for a variable

② Replace that value in the other equation.

③ Solve for other variable.

④ Plug this value into ①.

⑤ Write solution as an ordered pair.

Check:

$$\begin{array}{ll} y = 5x & x + y = 12 \\ 10 = 5(2) & 2 + 10 = 12 \\ 10 = 10 & 12 = 12 \end{array}$$

b.

$$7x - 3y = 2$$

② $7(2y - 6) - 3y = 2$

$$14y - 42 - 3y = 2$$

$$11y - 42 = 2$$

$$\begin{array}{r} 11y - 42 = 2 \\ +42 \quad +42 \\ \hline 11y = 44 \\ \frac{11y}{11} = \frac{44}{11} \end{array}$$

③ $y = 4$

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

① $x = 2y - 6$

$$x = 2(4) - 6$$

$$x = 8 - 6$$

$$x = 2$$

$(2, 4)$

c.

$$6y + 5x = 9$$

$$6y + 5(-3y - 7) = 9$$

$$6y - 15y - 35 = 9$$

$$\begin{array}{r} 6y - 15y - 35 = 9 \\ -9y - 35 = 9 \\ +35 \quad +35 \\ \hline -9y = 44 \\ \frac{-9y}{-9} = \frac{44}{-9} \end{array}$$

$$y = -\frac{44}{9}$$

$$\begin{array}{r} x + 3y = -7 \\ -3y \quad -3y \\ \hline \end{array}$$

$$x = -3y - 7$$

$$x = -3\left(-\frac{44}{9}\right) - 7$$

$$x = \frac{132}{9} - \frac{7}{1} \cdot \frac{9}{9}$$

$$\frac{132}{9} - \frac{63}{9}$$

$$x = \frac{69}{9} = \frac{23}{3}$$

$\left(\frac{23}{3}, -\frac{44}{9}\right)$ OR $\left(7\frac{2}{3}, -4\frac{8}{9}\right)$

d.

$$\begin{array}{r} y - 2x = 3 \\ + 2x \quad + 2x \\ \hline y = 2x + 3 \\ y = 2(11) + 3 \\ y = -22 + 3 = -19 \end{array}$$

(-11, -19)

$$\begin{array}{r} 3x - 2y = 5 \\ 3x - 2(2x + 3) = 5 \\ 3x - 4x - 6 = 5 \\ -x - 6 = 5 \\ \quad +6 \quad +6 \\ \hline -x = 11 \\ \quad -1 \quad -1 \\ \hline x = 11 \end{array}$$

* Note, if you get
 $15 = 15$ T same line
 infinitely many solutions

$15 = 13$ F
 no solution

e. $x = -3y + 4$

$$\begin{array}{r} 6y + 2x = 8 \\ 6y + 2(-3y + 4) = 8 \\ 6y - 6y + 8 = 8 \\ 8 = 8 \text{ T} \end{array}$$

infinitely many
 solution