

5.7 Continued

Skills: Solve for x

$$\begin{aligned}
 -8(x+5) + 2x &< 3x - 17 \\
 -8x - 40 + 2x &< 3x - 17 \\
 -6x - 40 &< 3x - 17 \\
 -6x &+ 6x < 3x - 17 + 6x \\
 -40 &< 9x - 17 \\
 +17 &+17 \\
 -23 &< 9x \\
 \frac{-23}{9} &< \frac{9x}{9} \\
 -2\frac{5}{9} &\text{ or } \boxed{-\frac{23}{9} < x}
 \end{aligned}$$

Substitution: Solving Systems

Example 1:

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

$(-5, -25)$   
 $y = 5(-5)$

Example 2:

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

Example 3:

$$\begin{aligned}
 2x - 3y &= 7 \\
 y &= x - 1 \\
 2x - 3(x - 1) &= -1 \\
 2x - 3x + 3 &= -1 \\
 -1x + 3 &= -1 \\
 -1x &= -4 \\
 x &= 4 \\
 y &= 4 - 1 \\
 y &= 3
 \end{aligned}$$

$(4, 3)$

Example 4:

$$\begin{aligned}
 y &= 4x - 10 \\
 y &= 5 - x \\
 5 &= 4x - 10 \\
 +10 &+10 \\
 15 &= 4x \\
 \frac{15}{4} &= \frac{4x}{4} \\
 \frac{15}{4} &= x
 \end{aligned}$$

$(3, 2)$   
 $y = 4(3) - 10$   
 $y = 12 - 10$   
 $y = 2$

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Example 5

$$\begin{aligned}
 x &= -4y \\
 x &= 4 + 6y \\
 4 - 6y &= -4y \\
 +6y &+6y \\
 \frac{4}{2} &= \frac{8y}{2} \\
 2 &= y
 \end{aligned}$$

Example 7

$$\begin{aligned}
 -4x + 4 &= 6 & y = \\
 -10x - 25 &= 42 \\
 -10x - 2(4x + 6) &= 4 \\
 -10x - 8x - 12 &= 4 \\
 -18x - 12 &= 4 \\
 -18x &= 16 \\
 \frac{-18x}{-18} &= \frac{16}{-18} \\
 x &= -\frac{8}{9} \\
 -4(-\frac{8}{9}) + y &= 6 \\
 \frac{32}{9} + y &= 6 \\
 y &= 6 - \frac{32}{9} \\
 y &= \frac{54}{9} - \frac{32}{9} \\
 y &= \frac{22}{9}
 \end{aligned}$$

$(-\frac{8}{9}, \frac{22}{9})$

Example 9

$$\begin{aligned}
 x + y &= 19 \\
 x - 2y &= 1 & x = 2y \\
 2y + 1 &= 4y + 19 \\
 6y + 1 &= 19 \\
 6y &= 18 \\
 y &= 3
 \end{aligned}$$

$(7, 3)$

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Example 5

$$\begin{aligned} x &= -4y \\ x &= 14 + 6y \\ 4 - 6y &= -4y \\ +6y & \quad +6y \\ \frac{4}{2} &= \frac{8y}{2} \\ 2 &= y \end{aligned}$$

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

$(-8, 2)$

Example 6

$$\begin{aligned} y &= -3x + 5 \\ 5x - 4y &= -3 \\ 5x - 4(-3x + 5) &= -3 \\ 5x + 12x - 20 &= -3 \\ 17x - 20 &= -3 \\ +20 & \quad +20 \\ 17x &= 17 \\ \frac{17x}{17} &= \frac{17}{17} \\ x &= 1 \end{aligned}$$

$(1, 2)$

Example 7

$$\begin{aligned} -4x + y &= 6 & y &= 4x + 6 \\ -10x - 2y &= 42 \\ -10x - 2(4x + 6) &= 42 \\ -10x - 8x - 12 &= 42 \\ -18x - 12 &= 42 \\ +12 & \quad +12 \\ -18x &= 54 \\ \frac{-18x}{-18} &= \frac{54}{-18} \\ x &= -3 \end{aligned}$$

$(-3, -6)$

Example 8

$$\begin{aligned} -5x + y &= 2 & \frac{y}{y} \cdot y &= \frac{2}{y} \cdot y \\ -3x + 6y &= -2 & \frac{6y}{6} \cdot y &= \frac{-2}{6} \cdot y \\ -3x + 6(5x - 2) &= -2 & \frac{y}{y} \cdot (5x - 2) &= \frac{-2}{y} \cdot (5x - 2) \\ -3x + 30x - 12 &= -2 & 27x - 12 &= -2 \\ 27x - 12 &= -2 \\ +12 & \quad +12 \\ 27x &= 10 \\ \frac{27x}{27} &= \frac{10}{27} \\ x &= \frac{10}{27} \end{aligned}$$

$(0, -2)$

$$\begin{aligned} 2 &= \\ 1(6x - 11) &= \\ 3y &= -7 \\ 3(6x - 11) &= -7 \\ -18x + 33 &= -7 \\ -18x + 33 &= -7 \\ -30x + 33 &= -7 \\ -20x &= -40 \\ \frac{-20x}{-20} &= \frac{-40}{-20} \\ x &= 2 \end{aligned}$$

$(2, 1)$

Example 9

$$\begin{aligned} x + y &= 19 \\ x - 2y &= 1 & x &= 2y + 1 \\ 2y + 1 + y &= 19 \\ 3y + 1 &= 19 \\ -1 & \quad -1 \\ 3y &= 18 \\ \frac{3y}{3} &= \frac{18}{3} \\ y &= 6 \end{aligned}$$

$(7, 3)$

Example 10

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

$(3, -4)$

$$\begin{aligned} 2 &= 4 \\ 4x - 10 &= \\ 5 &= 5 - x \\ 5 &= 4x - 10 \\ +10 & \quad +10 \\ 15 &= 5 - x \\ \frac{15}{5} &= \frac{5 - x}{5} \\ 3 &= \frac{5 - x}{5} \end{aligned}$$

$(3, 2)$

$$\begin{aligned} y &= 4(2) + 1 \\ y &= 8 + 1 \\ y &= 9 \end{aligned}$$