

6.4 Using the Elimination Method with Multiplication

Example 1

$$\begin{aligned} -11 \cdot (2x + y) &= (-9) \cdot -11 \longrightarrow \\ 4x + 11y &= 9 \end{aligned}$$

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

$$\begin{aligned} -22x - 11y &= 99 \\ 4x + 11y &= 9 \\ \hline -18x &= 108 \\ -18 & \quad \quad -18 \\ \hline x &= -6 \end{aligned}$$

$$(-6, 3)$$

Example 2

$$\begin{aligned} -2 \cdot (3x + 5y) &= (11) \cdot -2 \\ 3 \cdot (2x + 3y) &= (7) \cdot 3 \end{aligned}$$

$$\begin{aligned} 3x + 5(1) &= 11 \\ 3x + 5 &= 11 \\ -5 \quad \quad -5 & \\ \hline 3x &= 6 \\ \frac{3x}{3} &= \frac{6}{3} \\ x &= 2 \end{aligned}$$

$$\begin{aligned} -6x - 10y &= -22 \\ 6x + 3y &= 21 \\ \hline -y &= -1 \\ -1 & \quad \quad -1 \\ \hline y &= 1 \end{aligned}$$

$$(2, 1)$$

Example 3

$$\begin{aligned} -3 \cdot (4x + 3y) &= (8) \cdot -3 \\ 4 \cdot (3x - 5y) &= (-23) \cdot 4 \end{aligned}$$

$$\begin{aligned} 4x + 3(4) &= 8 \\ 4x + 12 &= 8 \\ -12 \quad -12 & \\ \hline 4x &= -4 \\ \frac{4x}{4} &= \frac{-4}{4} \\ x &= -1 \end{aligned}$$

$$\begin{aligned} -12x - 9y &= -24 \\ 12x - 20y &= -92 \\ \hline -29y &= -116 \\ \frac{-29y}{-29} &= \frac{-116}{-29} \\ y &= 4 \end{aligned}$$

$$(-1, 4)$$

Example 4

$$\begin{aligned} 2x - 3y &= 8 \\ -5x + 2y &= 13 \end{aligned}$$

$$\begin{aligned} 10x - 15y &= 40 \\ -10x + 4y &= 26 \\ \hline -11y &= 66 \\ \frac{-11y}{-11} &= \frac{66}{-11} \\ y &= -6 \end{aligned}$$

$$\begin{aligned} 2x - 3(-6) &= 8 \\ 2x + 18 &= 8 \\ 2x &= -10 \\ x &= -5 \end{aligned}$$

$$(-5, -6)$$

$$\begin{aligned} 4x - 6y &= 16 \\ -15x + 6y &= 39 \\ \hline -11x &= 55 \\ \frac{-11x}{-11} &= \frac{55}{-11} \\ x &= -5 \end{aligned}$$

$$\begin{aligned} 2(-5) - 3y &= 8 \\ -10 - 3y &= 8 \\ -3y &= 18 \\ y &= -6 \end{aligned}$$

Example 5

$$3x - 7y = 5$$

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

$$-5x + 0y = 5$$

$$\begin{array}{r} 15x - 35y = 25 \\ -15x + 27y = 15 \\ \hline -8y = 40 \\ \frac{-8y}{-8} = \frac{40}{-8} \\ y = -5 \end{array}$$

$$\begin{array}{r} 3x - 7(-5) = 5 \\ 3x + 35 = 5 \\ 3x = -30 \\ x = -10 \end{array}$$

$$(-10, -5)$$

$$\begin{array}{r} 27x - 63y = 45 \\ -35x + 63y = 35 \\ \hline -8x = 80 \\ \frac{-8x}{-8} = \frac{80}{-8} \\ x = -10 \end{array}$$

$$\begin{array}{r} 3(-10) - 7y = 5 \\ -30 - 7y = 5 \\ -7y = 35 \\ y = -5 \end{array}$$

Example 6

$$2x - 3y = 6$$

$$4y = -7x - 8$$

Example 7

$$6x = 2y + 1$$

$$3y = 2x - 5$$

Example 8

$x =$ cost per pack of hot dogs
 $y =$ cost per lb of ground beef

Two women are shopping for items for their separate cookouts. The first woman purchases 4 packs of hot dogs and 5 lbs of ground beef for hamburgers, and she pays a total of \$33. The second woman purchases 3 packs of hot dogs and 7 lbs of ground beef, and she pays a total of \$41. Find out how much each pack of hot dogs cost and how much the ground beef is per pound.

$$4x + 5y = 33$$

$$3x + 7y = 41$$

$$\begin{array}{r} 12x + 15y = 99 \\ -12x - 21y = -123 \\ \hline \end{array}$$

$$\begin{array}{r} -13y = -65 \\ -13 \quad -13 \\ \hline \end{array}$$

$$y = 5$$

$$4x + 5(5) = 33$$

$$4x + 25 = 33$$

$$4x = 8$$

$$x = 2$$

\$2/pk of hot dogs
 \$5/lb of beef

$$\begin{array}{r} 28x + 35y = 231 \\ -15x - 35y = -205 \\ \hline \end{array}$$

$$\begin{array}{r} 13x = 26 \\ 13 \quad 13 \\ \hline \end{array}$$

$$x = 2$$

$$4(2) + 5y = 33$$

$$8 + 5y = 33$$

$$5y = 25$$

$$y = 5$$