

Algebra 1

Chapter 6

Section 6-3 part 1

Elimination Method

The image shows a handwritten solution for a system of linear equations using the elimination method. At the top, two equations are listed: $3x - 5y = 18$ (circled in green) and $-2x + 5y = -7$ (circled in blue). A pink 'X' is drawn over both equations, indicating they will be subtracted from each other. A blue horizontal line is drawn under the second equation. Below the equations, the result of the elimination is shown: $x = 11$. Two arrows point from the original equations to the substitution steps. On the left, the first equation is substituted with $x = 11$: $3(11) - 5y = 18$. The 33 is crossed out, and -33 is added to both sides, resulting in $-5y = -15$. Dividing by -5 gives $y = 3$. On the right, the second equation is substituted with $x = 11$: $-2(11) + 5y = -7$. The -22 is crossed out, and $+22$ is added to both sides, resulting in $5y = 15$. Dividing by 5 gives $y = 3$. In the center, the final solution is written as $(11, 3)$.

$$\begin{array}{l} 3x - 5y = 18 \\ -2x + 5y = -7 \end{array}$$
$$x = 11$$
$$\begin{array}{l} 3(11) - 5y = 18 \\ \cancel{33} - 5y = 18 \\ -33 \\ \hline -5y = -15 \\ \frac{-5y}{-5} = \frac{-15}{-5} \\ y = 3 \end{array}$$

solution
 $(11, 3)$

$$\begin{array}{l} -2(11) + 5y = -7 \\ \cancel{-22} + 5y = -7 \\ +22 \\ \hline 5y = 15 \\ \frac{5y}{5} = \frac{15}{5} \\ y = 3 \end{array}$$

Elimination Method

- The object of the elimination method is to "eliminate" one variable from the system by adding two whole equations together
 - > Need the two equations to have one set of "opposite" terms.

Elimination Method

$$\begin{array}{r}
 9x + 11y = 5 \\
 -1 \cdot (9x - 4y = 35) \\
 \hline
 -9x + 4y = -35 \\
 9x + 11y = 5 \\
 \hline
 15y = -30 \\
 \frac{15y}{15} = \frac{-30}{15} \\
 y = -2
 \end{array}$$

Solution:
(3, -2)

$$\begin{array}{r}
 9x + 11(-2) = 5 \\
 9x - 22 = 5 \\
 +22 \quad +22 \\
 \hline
 9x = 27 \\
 \frac{9x}{9} = \frac{27}{9} \\
 x = 3
 \end{array}$$

Elimination Method

$$\begin{array}{r} \cancel{9x} - \cancel{y} = 6 \\ -\cancel{9x} + \cancel{y} = 6 \\ \hline 0 \neq 12 \end{array}$$

No solution
(Parallel Lines)

Elimination Method

$$\begin{array}{r} x + 3y = 6 \\ 7x - 3y = 10 \\ \hline 8x = 16 \\ \frac{8x}{8} = \frac{16}{8} \\ x = 2 \end{array}$$

Solution:
 $(2, \frac{4}{3})$

$2 + 3y = 6$
 $-2 \quad -2$
 $3y = 4$
 $y = \frac{4}{3}$

Elimination Method

$$\begin{array}{l}
 \textcircled{4x - 7y = 5} \\
 7 = 4x - 5y \\
 \begin{array}{r}
 \cancel{4x} - 5y = 7 \\
 \rightarrow -4x + 7y = -5 \\
 \hline
 2y = 2 \\
 \frac{2y}{2} = \frac{2}{2} \\
 y = 1
 \end{array} \\
 \begin{array}{r}
 \rightarrow 4x - 7(1) = 5 \\
 4x - 7 = 5 \\
 \quad +7 \quad +7 \\
 \hline
 4x = 12 \\
 \frac{4x}{4} = \frac{12}{4} \\
 x = 3
 \end{array} \\
 \text{Solution:} \\
 (3, 1)
 \end{array}$$

Elimination Method

$$\begin{array}{l}
 6x - 7y = 0 \\
 \textcircled{y - 6x = 0} \\
 \begin{array}{r}
 \cancel{-6x} + y = 0 \\
 \cancel{6x} - 7y = 0 \\
 \hline
 -6y = 0 \\
 \frac{-6y}{-6} = \frac{0}{-6} \\
 y = 0
 \end{array} \\
 \begin{array}{r}
 \cancel{-6x} = 0 \\
 \frac{-6x}{-6} = \frac{0}{-6} \\
 x = 0
 \end{array} \\
 \text{Solution:} \\
 (0, 0)
 \end{array}$$

Elimination Method

$$-10x + y = 5$$

$$-1 \cdot (-10x - 10y = 60)$$

$$10x + 10y = -60$$

$$\begin{array}{r} \cancel{10x} + y = 5 \\ \hline \end{array}$$

$$\frac{11y}{11} = \frac{-55}{11}$$

$$y = -5$$

Solution:
 $(-1, -5)$

$$\begin{array}{r} -10x - 5 = 5 \\ \hline +5 \quad -5 \\ \hline \end{array}$$

$$\frac{-10x}{-10} = \frac{10}{-10}$$

$$x = -1$$