

## Solving Systems of Equations by Elimination

Unit 4: Systems

Solve each of the following systems by using ELIMINATION:

1. $2x + 4y = 8$ $7x - 4y = -8$  $(0, 2)$	2. $8x + 8y = 19$ $-8x - 8y = -16$  No Solution
3. $-4x - 3y = -9$ $4x - 3y = 15$  $(3, -1)$	4. $-2x + 5y = -13$ $2x - 4y = 10$  $(-1, -3)$
5. $-x + 6y = 8$ $-2x - 6y = -20$  $(4, 2)$	6. $-2x + 6y = -20$ $4x + 6y = -14$  $(1, -3)$
7. $-4x + y = 10$ $-8x + y = 26$  $(-4, -6)$	8. $3x + 4y = -10$ $3x - 3y = 18$  $(2, -4)$
9. $-5x - 10y = 20$ $-5x - 7y = 5$  $(6, -5)$	10. $-2x + 5y = 6$ $-2x - 2y = 20$  $(-8, -2)$

$$\begin{aligned} 11. \quad & -8x + 8y = 0 \\ & x - 7y = 30 \end{aligned}$$

$$(-5, -5)$$

$$\begin{aligned} 12. \quad & 12x - 9y = 30 \\ & -3x - y = -14 \end{aligned}$$

$$(4, 2)$$

$$\begin{aligned} 13. \quad & -11x + 7y = -26 \\ & x - 9y = -6 \end{aligned}$$

$$(3, 1)$$

$$\begin{aligned} 14. \quad & -15x - 15y = 5 \\ & 5x + 5y = 0 \end{aligned}$$

No Solution

$$\begin{aligned} 15. \quad & 15x - y = 0 \\ & -5x - 5y = 0 \end{aligned}$$

$$(0, 0)$$

$$\begin{aligned} 16. \quad & -7x - 6y = -16 \\ & -2x - 4y = 16 \end{aligned}$$

$$(10, -9)$$

$$\begin{aligned} 17. \quad & 7x + 6y = -22 \\ & -2x + 4y = -28 \end{aligned}$$

$$(2, -6)$$

$$\begin{aligned} 18. \quad & -3x + 7y = 12 \\ & -2x - 4y = 8 \end{aligned}$$

$$(-4, 0)$$

$$\begin{aligned} 19. \quad & -7x - 4y = 13 \\ & -8x - 3y = 29 \end{aligned}$$

$$(-7, 9)$$

$$\begin{aligned} 20. \quad & 8x - 5y = -11 \\ & -3x - 4y = 10 \end{aligned}$$

$$(-2, -1)$$

$$\begin{array}{r} \textcircled{1} \quad 2x + 4y = 8 \\ + \quad 7x - 4y = -8 \\ \hline \end{array}$$

$$\frac{9x}{9} = \frac{0}{9}$$

$$\boxed{x=0}$$

Solution  
 $\boxed{(0, 2)}$

$$\begin{array}{r} 2(0) + 4y = 8 \\ 0 + 4y = 8 \end{array}$$

$$\frac{4y}{4} = \frac{8}{4}$$

$$\boxed{y=2}$$

$$\begin{array}{r} \textcircled{2} \quad 8x + 8y = 19 \\ + \quad -8x - 8y = -16 \\ \hline \end{array}$$

$$0 = 3$$

False Statement  
Solution

$\boxed{\text{NO SOLUTION}}$

$$\begin{array}{r} \textcircled{3} \quad -4x - 3y = -9 \\ + \quad 4x - 3y = 15 \\ \hline \end{array}$$

$$\frac{-6y}{-6} = \frac{6}{-6}$$

$$\boxed{y=-1}$$

Solution  
 $\boxed{(3, -1)}$

$$4x - 3(-1) = 15$$

$$\frac{4x + 3}{-3} = \frac{15}{-3}$$

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

$$\boxed{x=3}$$

$$\begin{array}{r} \textcircled{4} \quad -2x + 5y = -13 \\ + \quad 2x - 4y = 10 \\ \hline \end{array}$$

$$\boxed{y=-3}$$

Solution  
 $\boxed{(-1, -3)}$

$$2x - 4(-3) = 10$$

$$\frac{2x + 12}{-12} = \frac{10}{-12}$$

$$\frac{2x}{2} = \frac{-2}{2}$$

$$\boxed{x=-1}$$

$$\begin{array}{r} \textcircled{5} \quad -x + 6y = 8 \\ -2x - 6y = -20 \\ \hline \end{array}$$

$$\frac{-3x}{-3} = \frac{-12}{-3}$$

$$\boxed{x=4}$$

Solution  
 $\boxed{(4, 2)}$

$$-(4) + 6y = 8$$

$$\frac{-4 + 6y}{+4} = \frac{8}{+4}$$

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

$$\boxed{y=2}$$

$$\textcircled{6} \begin{cases} -2x + 6y = -20 \\ 4x + 6y = -14 \end{cases} \cdot -1 \Rightarrow \begin{cases} 2x - 6y = 20 \\ + 4x + 6y = -14 \\ \hline 6x = 6 \\ \frac{6x}{6} = \frac{6}{6} \\ x = 1 \end{cases}$$

$$\begin{cases} 4(1) + 6y = -14 \\ 4 + 6y = -14 \\ -4 \quad -4 \\ \hline 6y = -18 \\ \frac{6y}{6} = \frac{-18}{6} \\ y = -3 \end{cases}$$

Solution  $(1, -3)$

$$\textcircled{7} \begin{cases} -4x + y = 10 \\ -8x + y = 26 \end{cases} \cdot -1 \Rightarrow \begin{cases} 4x - y = -10 \\ + -8x + y = 26 \\ \hline -4x = 16 \\ \frac{-4x}{-4} = \frac{16}{-4} \\ x = -4 \end{cases}$$

$$\begin{cases} -4(-4) + y = 10 \\ 16 + y = 10 \\ -16 \quad -16 \\ \hline y = -6 \end{cases}$$

Solution  $(-4, -6)$

$$\textcircled{8} \begin{cases} 3x + 4y = -10 \\ 3x - 3y = 18 \end{cases} \cdot -1 \Rightarrow \begin{cases} 3x + 4y = -10 \\ + -3x + 3y = -18 \\ \hline 7y = -28 \\ \frac{7y}{7} = \frac{-28}{7} \\ y = -4 \end{cases}$$

$$\begin{cases} 3x - 3(-4) = 18 \\ 3x + 12 = 18 \\ -12 \quad -12 \\ \hline 3x = 6 \\ \frac{3x}{3} = \frac{6}{3} \\ x = 2 \end{cases}$$

Solution  $(2, -4)$

$$\textcircled{9} \begin{cases} -5x - 10y = 20 \\ -5x - 7y = 5 \end{cases} \cdot -1 \Rightarrow \begin{cases} -5x - 10y = 20 \\ + 5x + 7y = -5 \\ \hline -3y = 15 \\ \frac{-3y}{-3} = \frac{15}{-3} \\ y = -5 \end{cases}$$

$$\begin{cases} -5x - 10(-5) = 20 \\ -5x + 50 = 20 \\ -50 \quad -50 \\ \hline -5x = -30 \\ \frac{-5x}{-5} = \frac{-30}{-5} \\ x = 6 \end{cases}$$

Solution  $(6, -5)$

$$\textcircled{10} \quad \begin{aligned} -2x + 5y &= 6 \\ [-2x - 2y &= 20] \cdot -1 \end{aligned}$$

$$\begin{aligned} -2x - 2(-2) &= 20 \\ -2x + 4 &= 20 \\ \underline{-4 \quad -4} & \\ -2x &= 16 \\ \underline{-2 \quad -2} & \\ x &= -8 \end{aligned}$$

Solution  
 $(-8, -2)$

$$\begin{aligned} -2x + 5y &= 6 \\ + 2x + 2y &= -20 \\ \hline 7y &= -14 \\ \underline{7 \quad 7} & \\ y &= -2 \end{aligned}$$

$$\textcircled{11} \quad \begin{aligned} -8x + 8y &= 0 \\ [x - 7y &= 30] \cdot 8 \end{aligned}$$

$$\begin{aligned} x - 7(-5) &= 30 \\ x + 35 &= 30 \\ \underline{-35 \quad -35} & \\ x &= -5 \end{aligned}$$

Solution  
 $(-5, -5)$

$$\begin{aligned} -8x + 8y &= 0 \\ + 8x - 56y &= 240 \\ \hline -48y &= 240 \\ \underline{-48 \quad -48} & \\ y &= -5 \end{aligned}$$

$$\textcircled{12} \quad \begin{aligned} 12x - 9y &= 30 \\ [-3x - y &= -14] \cdot 4 \end{aligned}$$

$$\begin{aligned} -3x - 2 &= -14 \\ \underline{+2 \quad +2} & \\ -3x &= -12 \\ \underline{-3 \quad -3} & \\ x &= 4 \end{aligned}$$

Solution  
 $(4, 2)$

$$\begin{aligned} 12x - 9y &= 30 \\ + -12x - 4y &= -56 \\ \hline -13y &= -26 \\ \underline{-13 \quad -13} & \\ y &= 2 \end{aligned}$$

$$\textcircled{13} \quad \begin{aligned} -11x + 7y &= -26 \\ [x - 9y &= -6] \cdot 11 \end{aligned}$$

$$\begin{aligned} x - 9(1) &= -6 \\ x - 9 &= -6 \\ \underline{+9 \quad +9} & \\ x &= 3 \end{aligned}$$

Solution  
 $(3, 1)$

$$\begin{aligned} -11x + 7y &= -26 \\ + 11x - 99y &= -66 \\ \hline -92y &= -92 \\ \underline{-92 \quad -92} & \\ y &= 1 \end{aligned}$$

$$\textcircled{14} \begin{cases} -15x - 15y = 5 \\ [5x + 5y = 0] \cdot 3 \end{cases}$$

False Statement  
Solution

**No Solution**

$$\begin{aligned} -15x - 15y &= 5 \\ + 15x + 15y &= 0 \\ \hline 0 &\neq 5 \end{aligned}$$

$$\textcircled{15} \begin{cases} 15x - y = 0 \\ [-5x - 5y = 0] \cdot 3 \end{cases}$$

⇒

Solution  
**(0, 0)**

$$15x - 0 = 0$$

$$\frac{15x}{15} = \frac{0}{15}$$

$$\boxed{x = 0}$$

$$\begin{aligned} 15x - y &= 0 \\ + -15x - 15y &= 0 \\ \hline -16y &= 0 \end{aligned}$$

$$\frac{-16y}{-16} = \frac{0}{-16}$$

$$\boxed{y = 0}$$

$$\textcircled{16} \begin{cases} [-7x - 6y = -16] \cdot -2 \\ [2x - 4y = 16] \cdot 7 \end{cases}$$

⇒

Solution  
**(10, -9)**

$$-2x - 4(-9) = 16$$

$$\begin{aligned} -2x + 36 &= 16 \\ -36 & \quad -36 \end{aligned}$$

$$\frac{-2x}{-2} = \frac{-20}{-2}$$

$$\boxed{x = 10}$$

$$\begin{aligned} 14x + 12y &= 32 \\ + -14x - 28y &= 112 \\ \hline -16y &= 144 \end{aligned}$$

$$\frac{-16y}{-16} = \frac{144}{-16}$$

$$\boxed{y = -9}$$

$$\textcircled{17} \begin{cases} [7x + 6y = -22] \cdot 2 \\ [-2x + 4y = -28] \cdot 7 \end{cases}$$

⇒

Solution  
**(2, -6)**

$$-2x + 4(-6) = -28$$

$$\begin{aligned} -2x - 24 &= -28 \\ +24 & \quad +24 \end{aligned}$$

$$\frac{-2x}{-2} = \frac{-4}{-2}$$

$$\boxed{x = 2}$$

$$\begin{aligned} 14x + 12y &= -44 \\ -14x + 28y &= -196 \\ \hline 40y &= -240 \end{aligned}$$

$$\frac{40y}{40} = \frac{-240}{40}$$

$$\boxed{y = -6}$$

$$\textcircled{18} \begin{cases} [-3x + 7y = 12] \cdot -2 \\ [-2x - 4y = 8] \cdot 3 \end{cases} \Rightarrow$$

$$\begin{array}{r} 6x - 14y = -24 \\ + \quad -6x - 12y = 24 \\ \hline -26y = 0 \\ \frac{-26y}{-26} = \frac{0}{-26} \end{array}$$

$$-2x - 4(0) = 8$$

$$-2x - 0 = 8$$

$$\frac{-2x}{-2} = \frac{8}{-2}$$

$$\boxed{x = -4}$$

Solution  
 $\boxed{(-4, 0)}$

$$\boxed{y = 0}$$

$$\textcircled{19} \begin{cases} [-7x - 4y = 13] \cdot -3 \\ [-8x - 3y = 29] \cdot 4 \end{cases} \Rightarrow$$

$$\begin{array}{r} 21x + 12y = -39 \\ -32x - 12y = 116 \\ \hline -11x = 77 \\ \frac{-11x}{-11} = \frac{77}{-11} \end{array}$$

$$-7(-7) - 4y = 13$$

$$\begin{array}{r} 49 - 4y = 13 \\ -49 \quad -49 \\ \hline -4y = -36 \end{array}$$

$$\frac{-4y}{-4} = \frac{-36}{-4}$$

$$\boxed{y = 9}$$

Solution  
 $\boxed{(-7, 9)}$

$$\boxed{x = -7}$$

$$\textcircled{20} \begin{cases} [8x - 5y = -11] \cdot 3 \\ [-3x - 4y = 10] \cdot 8 \end{cases} \Rightarrow$$

$$\begin{array}{r} 24x - 15y = -33 \\ -24x - 32y = 80 \\ \hline -47y = 47 \\ \frac{-47y}{-47} = \frac{47}{-47} \end{array}$$

$$8x - 5(-1) = -11$$

$$\begin{array}{r} 8x + 5 = -11 \\ -5 \quad -5 \\ \hline 8x = -16 \end{array}$$

$$\frac{8x}{8} = \frac{-16}{8}$$

$$\boxed{x = -2}$$

Solution  
 $\boxed{(-2, -1)}$

$$\boxed{y = -1}$$

