

3.5 Solving Systems of Equations by Elimination

Solutions

Solve by elimination. State the system solution category.	
<p>1. $\begin{cases} x + y = 5 \\ x - y = 3 \end{cases}$</p> $\begin{array}{r} 2x + 0 = 8 \\ 2x = 8 \\ \frac{2x}{2} = \frac{8}{2} \\ x = 4 \end{array}$ $\begin{array}{r} x + y = 5 \\ 4 + y = 5 \\ \underline{-4} \quad \underline{-4} \\ y = 1 \end{array}$ <p>System solution: $\{(4, 1)\}$ System category: consistent and independent</p>	<p>2. $\begin{cases} x + y = 9 \\ -x + y = 1 \end{cases}$</p>
<p>3. $\begin{cases} 2x + 3y = 1 \\ -x - 2y = 2 \end{cases} \Rightarrow 2(-x - 2y) = 2 \cdot 2$</p> $\begin{array}{r} 2x + 3y = 1 \\ \underline{-2x - 4y = 4} \\ -y = 5 \\ -1(-y) = -1 \cdot 5 \\ y = -5 \\ 2x + 3y = 1 \\ 2x + 3 \cdot -5 = 1 \\ 2x + -15 = 1 \\ \underline{+15} \quad \underline{+15} \\ 2x = 16 \\ \frac{2x}{2} = \frac{16}{2} \\ x = 8 \end{array}$ <p>System solution: $\{(8, -5)\}$ System category: consistent and independent</p>	<p>4. $\begin{cases} 3x + y = -1 \\ 2x - 2y = -14 \end{cases}$</p>
Answers: 1. $\{(4, 1)\}$, consistent and independent; 3. $\{(8, -5)\}$, consistent and independent	

Solve by elimination. State the system solution category.

<p>5. $\begin{cases} 3x - 2y = 2 \\ 5x - 5y = 10 \end{cases}$</p> <p style="margin-left: 40px;">$\Rightarrow 5(3x - 2y) = 5 \cdot 2$ $15x - 10y = 10$</p> <p style="margin-left: 40px;">$\Rightarrow -3(5x - 5y) = -3 \cdot 10$ $-15x + 15y = -30$</p> <p style="margin-left: 40px;">$15x - 10y = 10$ $\underline{-15x + 15y = -30}$ $5y = -20$</p> <p style="margin-left: 40px;">$\frac{5y}{5} = \frac{-20}{5}$ $y = -4$</p> <p style="margin-left: 40px;">$3x - 2y = 2$ $3x - 2 \cdot (-4) = 2$ $3x + 8 = 2$ $\underline{-8 \quad -8}$ $3x = -6$</p> <p style="margin-left: 40px;">$\frac{3x}{3} = \frac{-6}{3}$ $x = -2$</p>	<p>6. $\begin{cases} 9x + 3y = 12 \\ 5x + 4y = 2 \end{cases}$</p>
<p>System solution: $\{(-2, -4)\}$ System category: consistent and independent</p>	

<p>7. $\begin{cases} 2x + 3y = 2 \\ 4x - 9y = -1 \end{cases}$</p> <p style="margin-left: 40px;">$\Rightarrow -2(2x + 3y) = -2 \cdot 2$ $-4x - 6y = -4$</p> <p style="margin-left: 40px;">$-4x - 6y = -4$ $\underline{4x - 9y = -1}$ $-15y = -5$</p> <p style="margin-left: 40px;">$\frac{-15y}{-15} = \frac{-5}{-15}$ $y = \frac{1}{3}$</p> <p style="margin-left: 40px;">$2x + 3 \cdot \frac{1}{3} = 2$ $2x + 1 = 2$ $\underline{-1 \quad -1}$ $2x = 1$</p> <p style="margin-left: 40px;">$\frac{2x}{2} = \frac{1}{2}$ $x = \frac{1}{2}$</p>	<p>8. $\begin{cases} 3x + 4y = 1 \\ 18x - 8y = 14 \end{cases}$</p>
<p>System solution: $\{(\frac{1}{2}, \frac{1}{3})\}$ System category: consistent and independent</p>	

Answers: 5. $\{(-2, -4)\}$ consistent and independent; 7. $\{(\frac{1}{2}, \frac{1}{3})\}$, consistent and independent

Solve by elimination. State the system solution category.

9.
$$\begin{cases} 4x + 6y = 10 \\ 2x + 3y = -5 \end{cases} \Rightarrow -2(2x + 3y) = -2 \cdot -5$$

$$\begin{array}{r} 4x + 6y = 10 \\ -4x + -6y = 10 \\ \hline 0 = 20 \end{array}$$

False.

System solution: \emptyset

System category: inconsistent

10.
$$\begin{cases} 5x + 4y = 10 \\ 10x + 8y = 6 \end{cases}$$

$$-4x + -6y = 10$$

11.
$$\begin{cases} 2x - 3y = 4 \\ -x + \frac{3}{2}y = -2 \end{cases} \Rightarrow 2\left(-x + \frac{3}{2}y\right) = 2 \cdot -2$$

$$\begin{array}{r} 2x - 3y = 4 \\ -2x + 3y = -4 \\ \hline 0 = 0 \end{array}$$

True.

System solution: $\{(x, y) \mid 2x - 3y = 4\}$

System category: consistent and dependent

12.
$$\begin{cases} 6x - y = -8 \\ -9x + \frac{3}{2}y = 12 \end{cases}$$

$$-2x + 3y = -4$$

Answers: 9. \emptyset , inconsistent; 11. $\{(x, y) \mid 2x - 3y = 4\}$, consistent and dependent