

Day 4 - Solving Systems Using Elimination (Adding) - Notes

Another method for solving systems of equations when one of the variables is not isolated by a variable is to use **elimination**. Elimination involves adding or multiplying one or both equations until one of the variables can be eliminated by adding the two equations together. Elimination is also called linear combinations.

Take a look at the following systems of equations. Add the equations together and try to solve the system—what do you notice?

a.

$$\begin{array}{r} 3x + 2y = 7 \\ -3x + 4y = 5 \\ \hline 6y = 12 \\ y = 2 \end{array}$$

x Variable dropped out

b.

$$\begin{array}{r} 2x - 3y = 4 \\ -4x + 5y = -8 \\ \hline \end{array}$$

No Variable dropped out

Steps for Solving Systems by Elimination

- Step 1:** Arrange the equations with like terms in columns.
Step 2: Analyze the coefficients of x or y. Multiply one or both equations by an appropriate number to obtain new coefficients that are opposites
Step 3: Add the equations and solve for the remaining variable.
Step 4: Substitute the value into either equation and solve.
Step 5: Check the solution by substituting the point back into both equation.

Elimination by Adding the Systems Together

Ex 1.

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

$$\begin{array}{r} -2x + -1 = -7 \\ +1 \quad +1 \\ \hline -2x = -6 \\ -2 \quad -2 \\ \hline x = 3 \end{array}$$

Ex 2.

$$\begin{array}{r} 4x - 2y = 2 \\ 3x + 2y = 12 \\ \hline 7x = 14 \\ x = 2 \end{array}$$

$$\begin{array}{r} 3(2) + 2y = 12 \\ 6 + 2y = 12 \\ 2y = 6 \\ y = 3 \end{array}$$

Solution: $(3, -1)$

Solution: $(2, 3)$

Elimination by Rearranging and Adding the Systems Together

Ex 3. $8x = -16 - y$
 $3x - y = 5$

$$\begin{array}{r} 8x + y = -16 \\ 3x - y = 5 \\ \hline 11x = -11 \\ x = -1 \end{array}$$

$$\begin{array}{r} 8(-1) + y = -16 \\ -8 + y = -16 \\ +8 \quad +8 \\ \hline y = -8 \end{array}$$

Solution: $(-1, -8)$

Ex 4. $2x + y = 8$
 $-y = 3 + 2x$

$$\begin{array}{r} 2x + y = 8 \\ -2x - y = 3 \\ \hline 0 = 11 \end{array}$$

Solution: No Solution