

## Solving Systems with 3 Variables

Here are the steps to solving three variables linear systems using elimination:

1. Write all equations in standard form with all variables lined up. Make sure to clear any fractions or decimals.
2. Choose a variable to eliminate. Then choose two equations and eliminate that variable.
3. Select a different pair and eliminate the same variable from step 2.
4. Now you have two linear equations with two variables to solve like normal.
5. Once you have solved for one variable, plug it back in to find the other two.

Solve this system:

$$\boxed{(-1, 2, 3)}$$

$$\begin{aligned} 4x - 2y + 3z &= 1 \\ -4(x + 3y - 4z = -7) &-3 \\ 3x + y + 2z &= 5 \end{aligned}$$

$$\begin{aligned} 4x - 2y + 3z &= 1 \\ -4x - 12y + 16z &= 28 \\ \hline (-14y + 19z) &= 29 \end{aligned} \quad -8$$

$$\begin{aligned} 112y - 152z &= -232 \\ -112y + 196z &= 364 \\ \hline 44z &= 132 \\ \frac{44z}{44} &= \frac{132}{44} \\ z &= 3 \end{aligned}$$

$$\begin{aligned} -3x - 9y + 12z &= 21 \\ 3x + y + 2z &= 5 \\ \hline (-8y + 14z) &= 26 \end{aligned} \quad 14$$

$$\begin{aligned} -8y + 14(3) &= 26 \\ -8y + 42 &= 26 \\ -8y &= -16 \\ y &= 2 \end{aligned}$$

$$\begin{aligned} x + 3(2) - 4(3) &= -7 \\ x + 6 - 12 &= -7 \\ x - 6 &= -7 \\ x &= -1 \end{aligned}$$

$$\begin{aligned} x &= 3z - 5 \\ 2x + 2z &= y + 16 \\ 7x - 5z &= 3y + 19 \end{aligned}$$

$$\begin{aligned} x - 3z &= -5 \\ (2x - y + 2z = 16) &-3 \\ 7x - 3y - 5z &= 19 \end{aligned}$$

$$\boxed{(4, -2, 3)}$$

$$\begin{aligned} -6x + 3y - 6z &= -48 \\ 7x - 3y - 5z &= 19 \\ \hline x - 11z &= -29 \end{aligned}$$

$$\begin{aligned} (x - 3z = -5) &-1 \\ x - 11z &= -29 \\ \hline -8z &= -24 \\ z &= 3 \end{aligned}$$

$$\begin{aligned} x &= 3(3) - 5 \\ &= 9 - 5 \\ x &= 4 \end{aligned}$$

$$\begin{aligned} 2(4) + 2(3) &= y + 16 \\ 8 + 6 &= y + 16 \\ 14 &= y + 16 \\ y &= -2 \end{aligned}$$