Note-Taking Study Guide 2.04

Graphing Systems of Equations With 3 Variables.

What are the 2 methods in solving systems of equations with 3 variables? _____ and _______

Steps for using the Elimination Method to Solve Systems of Equations with 3 Variables:

Step 1: Identify or Create opposite Coefficients. What is the opposite of 2x? _____
- Choose any 2 equations that have opposite coefficients and add them vertically to eliminate the variable.
- If there are not opposite coefficients you must multiply 1 or both equations by a constant to create a opposite coefficient.
  \[ x + 2y - z = -3 \]
  \[ 2x - 2y + 2z = 8 \]
  \[ 2x - y + 3z = 9 \]
- Identify the Opposite Coefficients: _____ and _____

Step 2: Identify or Create opposite Coefficients again using 2 different equations but the same variable.
- If you used equations 1 and 2 in the above example to eliminate the y, you would now have to use either equation 1 and 3 or equation 2 and 3 to eliminate y. Remember, eliminate the same variable in step 1 and step 2.
- What 2 equations would you use to eliminate y in step 2? _____ and _______
- What would you have to do to eliminate y? __________________________

Step 3: You should now have a new system with 2 variables.
- Solve this new system using techniques from 2.02 or 2.03 (Solving systems of Equations with 2 variables)

Step 4: Substitute and Solve
- Once you have solved the 2 variable system in Step 3 substitute those 2 variables into any of the 3 original equations and solve for the 3rd and final variable.
Steps for using the Substitution Method to Solve Systems of Equations with 3 Variables:

Step 1: Pick a variable and solve for it.
- Identify the variable that would be the easiest to solve for. Pick one that has no coefficient if possible.
  
  \[
  3x + 2y - z = 11 \\
  x - 3y + 2z = -1 \\
  2x - y - 3z = 12 
  \]

- In the above system, why would you choose \( x \) in the 2\(^{nd} \) equation over \( z \) in the 1\(^{st} \) equation and \( y \) in the 3\(^{rd} \) equation? 

Step 2: Substitute and simplify
- Once you have isolated your variable in step 1, substitute the expression into both equations and then simplify those 2 equations.
- We know have a system with \( \_\_\_ \) variables.

Step 3: You should now have a new system with 2 variables.
- Solve this new system using techniques from 2.02 or 2.03 (Solving systems of Equations with 2 variables)

Step 4: Substitute and Solve
- Once you have solved the 2 variable system in Step 3 substitute those 2 variables into any of the 3 original equations and solve for the 3\(^{rd} \) and final variable.

Try Example 1 using the Elimination Method and Example 2 using the Substitution Method: