Solving a system of equations in three variables.

You can use:

- Substitution
- Elimination
- Combination of Substitution and Elimination.

## Solve starting with Elimination.

1. 
$$2x - 4y + 3z = 11$$

2. 
$$7x + 3y - 5z = -39$$

3. 
$$3x + 8y + 4z = 14$$

Eliminate y using EQ's 1 and 2.

$$3(2x - 4y + 3z = 11)$$

$$4(7x + 3y - 5z = -39)$$

One of the main rules when solving a system of three equations is that you must use each equation at least once.

1. 
$$2x - 4y + 3z = 11$$

Eliminate y using EQ's 1 and 3.

2. 
$$7x + 3y - 5z = -39$$

3. 
$$3x + 8y + 4z = 14$$

$$2(2x - 4y + 3z = 11) \longrightarrow 4x - 8y + 6z = 22$$

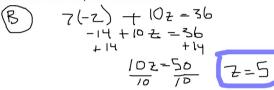
$$3x + 8y + 4z = 14 \longrightarrow + 3x + 8y + 4z = 14$$
B
$$7x + 10z = 36$$

## Use Equations A and B and solve for x & v:

$$A10(34x-11z=-123)$$
 340x-110z=-1230

(B) 
$$11(7x + 10 = 36) + \frac{77x + 1102 = 396}{417x = -\frac{834}{417}}$$
  
 $x = -2$ 

Now use either Eq A or B to find z:



Solving a system of equations in three variables starting with SUBSTITUTION:

1. 
$$5x + 3y + 3z = 51$$

2. 
$$4x - 2y + z = 22$$

3. 
$$x + 5y - 2z = 13$$

1. Solve one of the equations for one of its variables. you could solve the second equation for z:

$$2 = 22 + 2y - 4x$$

Now that you know that x = -2 and z = 5use one of the first three equations to find v.

1. 
$$2x - 4y + 3z = 11$$

2. 
$$7x + 3y - 5z = -39$$

3. 
$$3x + 8y + 4z = 14$$
  $\Rightarrow$   $3(-2) + 8y + 4(5) = 14$ 

Solution to this system is: (-2,0,5)

1. 
$$5x + 3y + 3z = 51$$

2. 
$$4x - 2y + z = 22$$

$$^{3.}$$
 x + 5y - 2z = 13

2. Substitute this quantity into both of the other two equations creating a system of equations with just two variables.

$$5x + 3y + 3(22 + 2y - 4x) = 5$$
  
 $5x + 3y + 66 + 6y - 12x = 51$   
 $-7x + 9y = -15$ 

Into Eq 1: 5x + 3y + 3(2z + 2y - 4x) = 5 5x + 3y + (66 + 6y - 12x = 5) 7x + 9y = -15 7x + 9y = -15 7x + 4y = -15

3. Solve this resulting system of equations for its two variables.

$$7x + 9y = -15 \longrightarrow -7x + 9y = 75$$

$$9 (9x + y = 57) \longrightarrow 81x + 9y = 513$$
Solve for y using this second equation and the value of 
$$-88x = -528$$

solve for y using this second equation and the value of x you just found:

You can now finish Hwk #20: Sec 3-6

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1. 
$$5x + 3y + 3z = 51$$

2. 
$$4x - 2y + z = 22$$

$$^{3.}$$
 x + 5y - 2z = 13

4. Substitute these two values into one of the original equations and solve for z. X=6 7=3

using Eq 2:

$$4(6) - 2(3) + 2 = 22$$
  
 $24 - 6 + 2 = 22$   
 $18 + 2 = 22$   
 $3 = 4$ 

Solution to this system is: (6,3,4)