## Algebra 2

Lesson Ch4: Matrices - Solving systems of 3 Variables By Hand Mrs. Snow, Instructor

All systems of 3 equations would be really nice to solve if they were all like:

$$
\begin{aligned}
& \text { so.... solve } \\
& \qquad \begin{aligned}
x-2 y+z & =-4 \\
-4 x+y & =-7 \\
z & =-4
\end{aligned}
\end{aligned}
$$

Using elimination:
$\{x-3 y+3 z=-4$
$\{2 x+3 y-z=15$
$4 x-3 y-z=19$
and....
$\left\{\begin{array}{c}2 x+y-z=5 \\ 3 x-y+2 z=-1 \\ x-y-z=0\end{array}\right.$

## Gaussian Elimination

Gaussian Elimination (aka row echelon form) is an effective algorithm (a step by step procedure for calculations) that may be used to reduce systems of 3 equations into a triangular shaped form:


In a college level algebra class you would learn how to perform Gaussian elimination to a matrix, in this class we will work with systems of equations. We saw last class that systems are easily converted to matrix equations.

To perform Gaussian Elimination on a system of equations, one uses a sequence of elementary row operations to modify the system until the last row of the system is a variable equal to a number, the second row is 2 variables equal to a number and the $1^{\text {st }}$ row is 3 variables equal to a number.

There are three types of elementary row operations:

1) Swapping two rows,
2) Multiplying a row by a non-zero number, and
3) Adding a multiple of one row to another row.


NOTE: You will use one row to change another without actually changing the one row. For example: Below we will add - 4 times row 3 to row 2 so to change row 2.

Let's put the words to a problem:
Solve using the Gaussian Method:

| $\left\{\begin{array}{l}2 x-y+3 z=13 \\ 4 x+3 y-2 z=5 \\ x-y-4 z=-4 \\ x\end{array}\right.$ | Work: |
| :--- | :--- |
|  |  |
|  |  |


| $\left\{\begin{array}{c}x-2 y+3 z=4 \\ 2 x+y-4 z=3 \\ -3 x+4 y-z=-2\end{array}\right.$ |  |  |
| :--- | :--- | :--- |
|  |  |  |

