LA - 1.3 - Solving Matrices

Basically, add or subtract multiples of other equation. Or multiply by integers.
Goal: Diagonal Form

Solving a system of equations using the Gauss-Jordan Elimination Method

$x + y = 3 \quad 2x + y = 4$

Line up the terms!

Interchange any two equuations

$1x + 1y = 3$

$\begin{bmatrix} 1 & 1 & | & 3 \\ 2 & 1 & | & 4 \end{bmatrix}$

$2x + 1y = 4$

Replace Coefficients

Start with a Top Left 1 or get it! Can't be Zero!

Calculator

2nd Matrix
Edit 3x4 Enter Data
2nd Quit
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Need Top left 1
Diagonal Down 1
Others Zeros
Right: Answers

$\begin{bmatrix} 1 & 0 & | & 1 \\ 0 & 1 & | & 2 \end{bmatrix}$

Diagonal Form

$\begin{bmatrix} 1 & 1 & | & 3 \\ 2 & 1 & | & 4 \end{bmatrix}$ r_1 Equation #1 $x + y = 3$
r_2 Equation #2 $2x + y = 4$

OR $r_2 \times \frac{1}{2}, r_2 - r_1$

$\begin{bmatrix} 1 & 1 & | & 3 \\ 0 & -1 & | & -2 \end{bmatrix}$

Row 1 Does Not Change*

$r_2 - 2r_1$ *Subtract* $2 \times row_1$ *from* row_2

Change an equation by adding to it a multiple of another equation

$2 - 2(1) = 0$ $\quad r_2c_1 - 2(r_1c_1) = r_2c_1$

$1 - 2(1) = -1$ $\quad r_2c_2 - 2(r_1c_2) = r_2c_2$

$4 - 2(3) = -2$ $\quad r_2c_3 - 2(r_1c_2) = r_2c_3$

Get a Zero!

Called Pivoting about r_1c_1

$\begin{bmatrix} 1 & 1 & | & 3 \\ 0 & 1 & | & 2 \end{bmatrix}$

$r_2 \times -1$ $\quad -1 \times row_2$

Multiply an equation by a non-zero number

$0 \times -1 = 0$ $\quad r_2c_1 \times -1 = r_2c_1$

$-1 \times -1 = 1$ $\quad r_2c_2 \times -1 = r_2c_2$

$-2 \times -1 = 2$ $\quad r_2c_3 \times -1 = r_2c_3$

Get a One!

$\begin{bmatrix} 1 & 0 & | & 1 \\ 0 & 1 & | & 2 \end{bmatrix}$ $r_1 - r_2$

$\begin{bmatrix} x & 0 & | & 1 \\ 0 & y & | & 2 \end{bmatrix}$ $x = 1, y = 2$

Must get to Diagonal-Form!

Subtract row_2 *from* row_1

Diagonal Form

$\begin{bmatrix} 1 & 0 & | & 1 \\ 0 & 1 & | & 2 \end{bmatrix}$ $x = 1, y = 2$

Coefficients of 1! Answers

Get a Zero!

Diagonal Form

$\begin{bmatrix} 1 & 0 & 0 & | & 1 \\ 0 & 1 & 0 & | & 2 \\ 0 & 0 & 1 & | & 3 \end{bmatrix}$ $x = 1, y = 2, z = 3$

Equation #1 $x + y = 3$

Equation #2 $2x + y = 4$

$x + y = 3$
$-(2x + y = 4)$
$-x + 0 = -1$

$x + y = 3$
$(1) + y = 3$

$x = 1$
$y = 2$
$(1,2)$

Elimination:
Get rid of the fractions
Multiply (LCM)
Line up the terms!
Add or subtract
Solve
Substitute
Solve
Intersection

Math 10