

Gauss - Jordan Elimination.

$$\text{ex1: } \begin{cases} x + 2y = 3 \\ 3x + 4y = 5 \end{cases}$$

$$\text{ex2: } \begin{cases} -2x + 3y = -13 \\ x + 5y = -13 \end{cases}$$

A few more examples

$$\text{ex: } \begin{cases} 2x - y = 5 \\ x + 3y = 6 \end{cases}$$

$$\begin{cases} x - 4y = 6 \\ 2x + 11y = -7 \end{cases}$$

$$\begin{cases} x + 2y - z = 3 \\ 2x + 5y - 2z = 7 \\ -x + y + 5z = -12 \end{cases}$$

$$\begin{cases} 2x + 3y + 4z = 2 \\ x + 2y + 2z = 1 \\ x + y + z = 2 \end{cases}$$

(no sol)

$$\begin{cases} 2x + y - z = 2 \\ x - y + 2z = 3 \\ x + y - z = 1 \end{cases}$$

examples of Gauss-Jordan Elimination.

Tools: Row SWAP, ADD, scalar mult.

$$\begin{cases} X - 2y + 3z = 9 \\ -X + 3y = -4 \\ 2x - 5y + 5z = 17 \end{cases} \Rightarrow \begin{bmatrix} 1 & -2 & 3 & | & 9 \\ -1 & 3 & 0 & | & -4 \\ 2 & -5 & 5 & | & 17 \end{bmatrix}$$

w/ unique sol. $(1, -1, 2)$

$$\begin{bmatrix} 0 & 1 & 1 & | & -3 \\ 1 & 2 & -1 & | & 2 \\ 2 & 4 & 1 & | & -2 \\ 2 & 5 & 2 & | & -5 \end{bmatrix} \Rightarrow \begin{bmatrix} 1 & 0 & 0 & | & 2 \\ 0 & 1 & 0 & | & -1 \\ 0 & 0 & 1 & | & -2 \\ 0 & 0 & 0 & | & 0 \end{bmatrix}$$

Solution $(2 - t, -1 + t, -2 + t, t)$

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

Solution $(2 + s - t, s, 1 + t, t)$

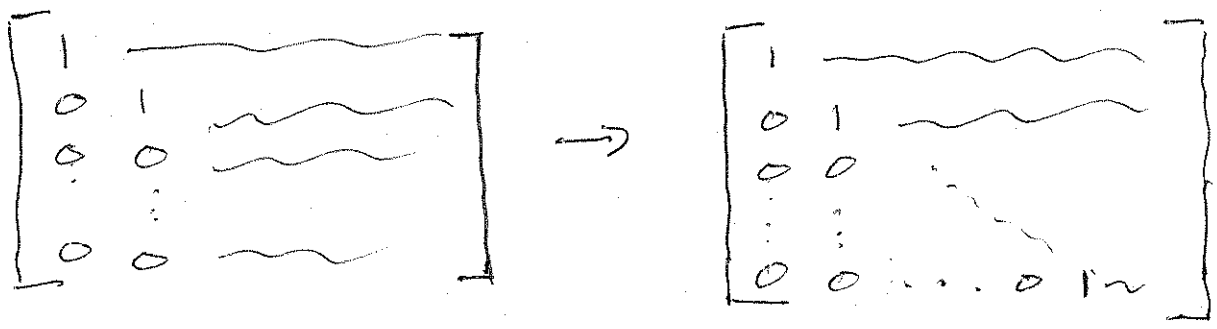
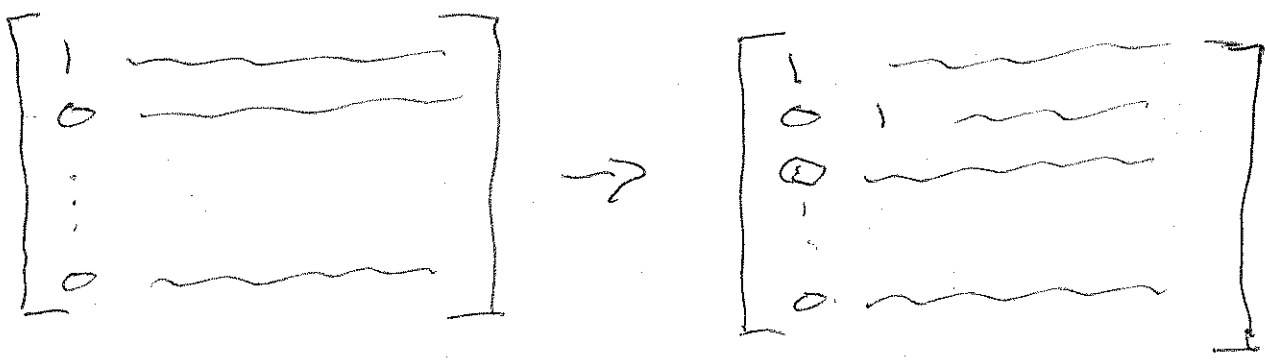
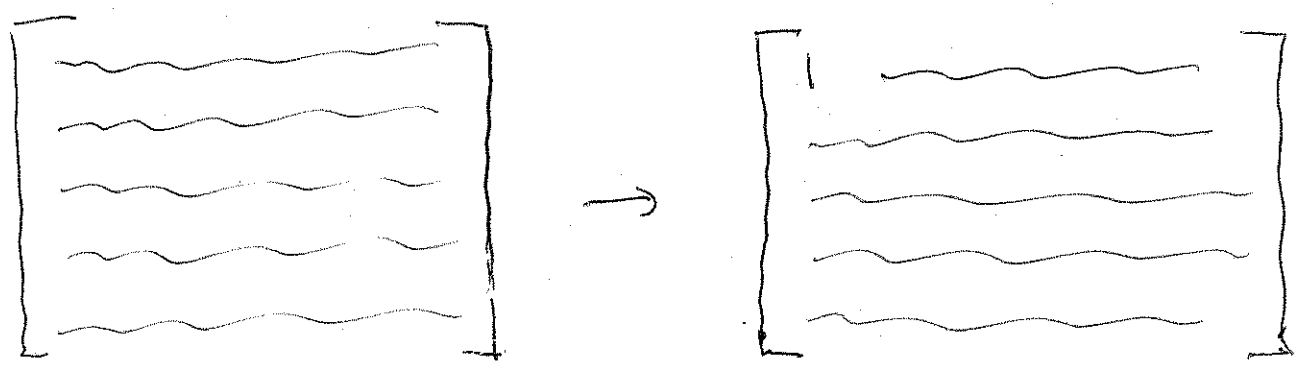
$$\text{OR } \begin{bmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{bmatrix} = \begin{bmatrix} 2 \\ 0 \\ 1 \\ 0 \end{bmatrix} + s \begin{bmatrix} 1 \\ 1 \\ 0 \\ 0 \end{bmatrix} + t \begin{bmatrix} -1 \\ 0 \\ 1 \\ 1 \end{bmatrix}$$

(see supplemental algorithms)

GAUSS - JORDAN ELIMINATION OVERVIEW

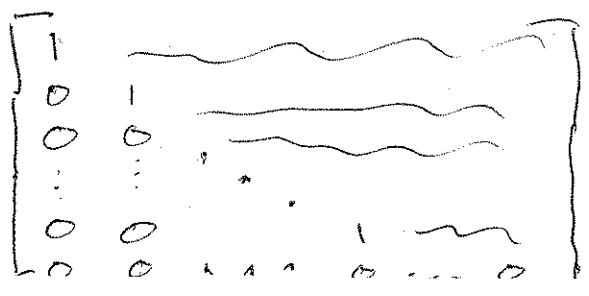
3.3
3/4

- TOOLS:
- ① swap rows
 - ② multiply a row by a scalar
 - ③ add rows.

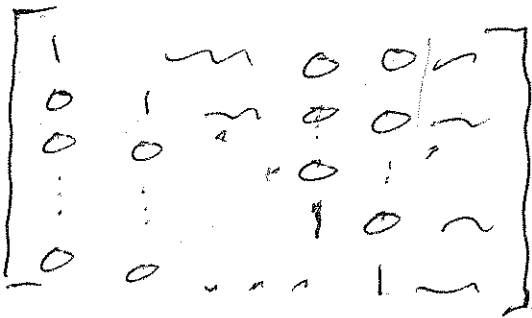
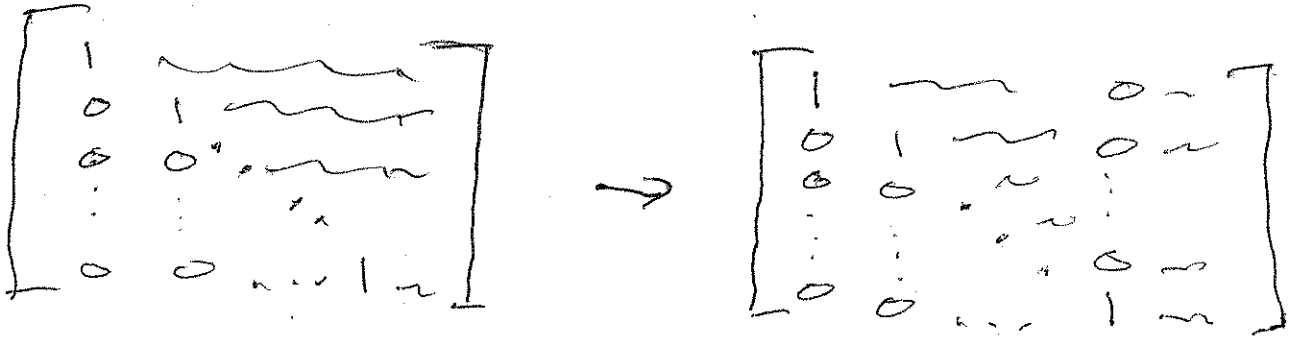


OR

Key: "ones" on the "diagonal" & zeros below.



Back substitution



Key: zeros above
ones ... work right
to left.

It is possible to get rows
or cols of zeros. But all non-zero
or zero entries should be in the
col(s) on the right.