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math.berkeley.edu/~yxy/math54 ← look here for grade dist. and weekly HW.

Midterm 1: 02/12 (Friday) || 02/19 - last day to drop

Office Hours: 3-4:30p M & F @ 999 Evans

§1.1, §1.2: Systems of Linear Eqns.

e.g. $\begin{cases} x+y=1 & [\text{ROW } 1] \\ x-y=-3 & [\text{ROW } 2] \end{cases}$

[ROW 1] + [ROW 2] ⟶ $2x=-2$.
(this gets rid of y) $x=-1$

[ROW 1] − [ROW 2] ⟶ $2y=4$
(this gets rid of x) $y=2$

General Case: Gaussian Elimination ★ every eqn is linear

- Represent equations by matrices.

e.g. $\begin{cases} x_1+5x_2-x_4=b \\ x_1+x_2+x_3+x_4=0 \\ x_2-2x_3-8x_4=1 \end{cases}$ ← this can be represented w/ a 3×4 coefficient matrix.

↖ table of numbers $\begin{bmatrix} n & n \\ n & n \end{bmatrix}$

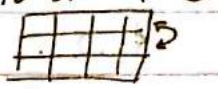
	x_1	x_2	x_3	x_4
eqn 1	1	5	0	-1
eqn 2	1	1	1	1
eqn 3	0	1	-2	-8

← no x_3 in eqn 1 so coeff. = 0.

Augmented matrix (the constants).

$$\left[\begin{array}{cccc|c} 1 & 5 & 0 & -1 & 6 \\ 1 & 1 & 1 & -1 & 0 \\ 0 & 1 & -2 & -8 & 1 \end{array}\right]$$

Elementary Row operations:

1. (Replacement) Add a multiple of one row to another
2. (Interchange) Change position of a row 
3. (Scaling) Multiply a row by a nonzero constant.

e.g. Solve: $\begin{cases} x_1 - 2x_2 - x_3 + 3x_4 = 0 \\ -2x_1 + 4x_2 + 5x_3 - 5x_4 = 3 \\ 3x_1 - 6x_2 - 6x_3 + 8x_4 = 2 \end{cases}$

$$\begin{array}{c} \\ R1 \\ R2 \\ R3 \end{array}\left[\begin{array}{cccc|c} 1 & -2 & -1 & 3 & 0 \\ -2 & 4 & 5 & -5 & 3 \\ 3 & -6 & -6 & 8 & 2 \end{array}\right]$$

mul R1 by 2, add to R2

$$\left[\begin{array}{cccc|c} 1 & -2 & -1 & 3 & 0 \\ 0 & 0 & 3 & 1 & 3 \\ 3 & -6 & -6 & 8 & 2 \end{array}\right]$$

*the general means is to try eliminate R2 & R3's 1st column.

mul R1 by 3, sub from R3

$$\left[\begin{array}{cccc|c} 1 & -2 & 1 & 3 & 0 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & -3 & -1 & 2 \end{array}\right]$$

add R2 to R3

$$\left[\begin{array}{cccc|c} 1 & -2 & 1 & 3 & 0 \\ 0 & 0 & 3 & 1 & 3 \\ 0 & 0 & 0 & 0 & 5 \end{array}\right]$$

→ "Recover the system"

$x_1 - 2x_2 + x_3 + 3x_4 = 0$

$3x_3 + x_4 = 3$

$0 = 5$ (!!!)

No solution (or we made a mistake_) inconsistent.