

Meeting 4: WED Q & A

- HMA DOE
- NEXT WK:

Kyle : HW1b, EXTRA CREDIT 2(A)

Sergio : 5 mins: WHAT I DID THIS SUMMER

Tommy : HW1b. PROBLEM 1

Chris Cain : interpreting HW1b prob 3

John Lee : explain HW1b eg (2.1),  
discuss B.C.

Keep in mind : STRICT 5 min limit

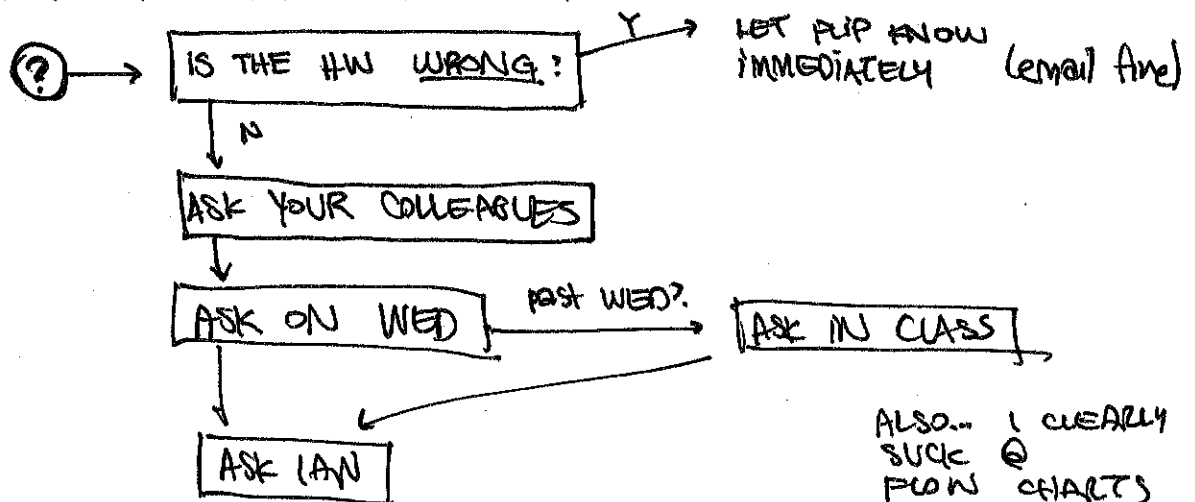
- this is about style & content
- this week: GETTING USED TO SPEAKING
- focus: timing.

... subsequent weeks will add on more foci.

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## QUESTIONS?

ORDER OF OPERATIONS : HW

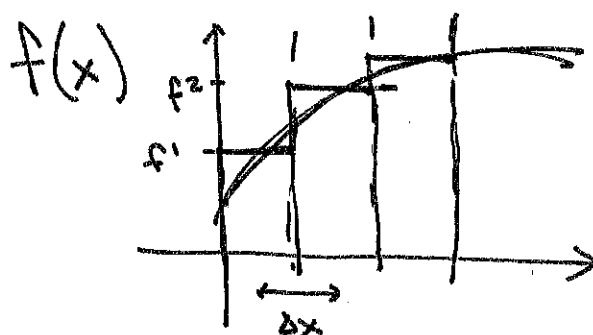
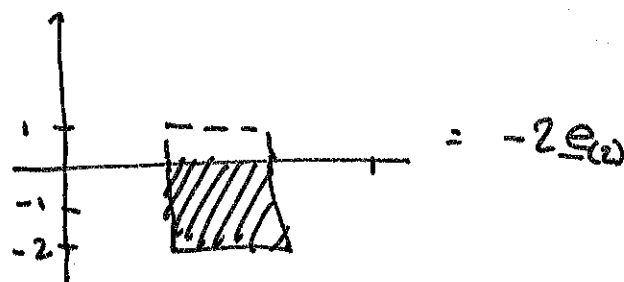
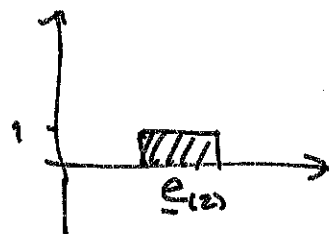


OFFICE HOURS? IF NECESSARY.

# DISCRETIZED DERIVATIVES

↳ you do this in computational physics when defining numerical calculus...

Monday PM: CAN THINK OF FUNCTIONS AS "HISTOGRAMS" ... ? DEFINE LITTLE LEGO PIECE BASIS VECTORS.



no symmetric derivative ...  
( $\nabla$  is vector)  
↓

$$\underline{f} = \begin{pmatrix} f_1 \\ f_2 \\ \vdots \end{pmatrix}$$

LET'S USE FORWARD DERIVATIVE

$$\underline{f}' = \begin{pmatrix} \vdots \\ f_{i+1} - f_i \\ \vdots \end{pmatrix} \frac{1}{\Delta x}$$

have to worry about boundaries

one option: cyclic bc ("no BC")

$$\underline{f} = \begin{pmatrix} (f^0 = f^3) \\ f_1 \\ f_2 \\ f_3 \\ (f_4 = f_1) \end{pmatrix}$$

imaginary "BOUNDARY" terms

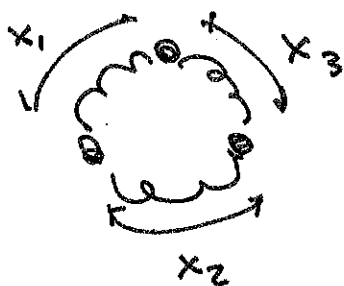
$$f' = \frac{1}{\Delta x} \begin{pmatrix} (f')^0 = (f')^4 \\ f_2 - f_1 \\ f_3 - f_2 \\ f_4 - f_3 \\ (f')^4 = (f')^0 \end{pmatrix} = \frac{1}{\Delta x} \begin{pmatrix} f_1 - f_3 \\ f_2 - f_1 \\ f_3 - f_2 \\ f_4 - f_3 \\ f_2 - f_1 \end{pmatrix}$$

NOW DO THE SAME FOR SECOND DERIVATIVE

$$(f'')^i = \frac{(f^{i+1} - f^i) - (f^i - f^{i-1}))}{\Delta x^2}$$

↑  
NOW CAN DEF. A SYMM. VERSION  
(analogous to  $\nabla^2$  is a scalar op)

## SPRINGY MOLECULE



convenient :

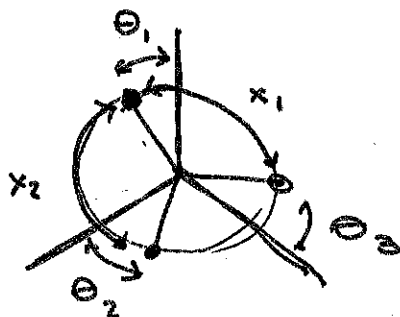
$$\text{set } m = 1 \\ k = 1$$

→  
A DIMENSIONAL ANALYSIS  
TRAVESTY !!

Q: is  $x_1 + x_2 + x_3$  fixed?

Q: what does this molecule do ?

LET'S USE CONVENIENT BASIS



$$x_1 = \frac{2\pi}{3} + \theta_1 - \theta_3$$

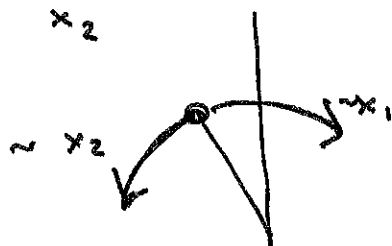
etc.

ADDITIONAL SIN:  
mixing up lengths  
w/ angles

... I probably meant ( $\omega=1$ )

EQUATION OF MOTION : (from  $m\ddot{x} = -kx$ )

$$\ddot{\theta}_1 = \underbrace{(\theta_2 - \theta_1)}_{x_2} - \underbrace{(\theta_1 - \theta_3)}_{x_1}$$



(up to  $\frac{2\pi}{3}$   
that  
cancels)

[can restore  
dimensions  
if want]

$$\ddot{\theta}_1 = -2\theta_1 + \theta_2 + \theta_3$$

(note: DISCRETIZED IN SPACE,  
not in time)

$$\ddot{\underline{\theta}} = \underline{\underline{A}} \underline{\theta}$$

olve for eigenvals  
eigenvecs

$$\ddot{\underline{V}} = \begin{pmatrix} \lambda_1 & & \\ & \lambda_2 & \\ & & \lambda_3 \end{pmatrix} \underline{V}$$

→ REDUCES TO 1D  
UNCOUPLED EQNS.

## Complaint Resolution



### University of California Riverside Nondiscrimination and Affirmative Action Policy

It is the policy of the University of California Riverside not to engage in discrimination against or harassment of any person employed or seeking employment with the University of California on the basis of race, color, national origin, religion, sex, gender, gender expression, gender identity, pregnancy, physical or mental disability, medical condition, genetic information, ancestry, marital status, age, sexual orientation, citizenship, or service in the uniformed services. Furthermore, University policy prohibits retaliation against any member of the University community filing a complaint of discrimination or harassment. This policy is intended to be consistent with the provisions of applicable State and Federal laws and University policies.

### Helpful Resources

- **ACADEMIC SENATE (FACULTY) »**

The senate is empowered by the regents to exercise direct control over academic matters of central importance to the University, and has advisory powers on all issues relating to the mission of the university: instruction, research and public service. The Academic Senate Committee on Privilege and Tenure has jurisdiction over three categories of cases: grievance cases, disciplinary cases, and early termination cases.

- **ADMINISTRATIVE RESOLUTION »**

The Office of Administrative Resolution is responsible for reviewing and resolving issues of policy, procedure, integrity and collegial relations that have the potential to impact the mission and well-being of the University. These issues include those involving students, staff and faculty.

- **CAMPUS COUNSEL »**

The Office of Campus Counsel (OCC) provides counsel and legal advice in the development of policy, procedures, and strategy related to the management and operation of the UC Riverside campus, its various colleges and graduate schools.

- **CARE ADVOCATE OFFICE »**

UCR's certified sexual/domestic violence survivor advocates aim to provide victims/survivors of sexual violence with on- and off-campus resources and supporting whichever path the survivor feels will be most helpful in their recovery. They welcome students, faculty, staff - as well as support individuals - to meet with them in a safe and highly confidential space (Surge 384 & Surge 386).

Care Advocates provide the following services:

- Listening without judgement
- Offering an introduction to options and resources
- Accompanying survivors to treatment and medical centers
- Assisting with the UCR adjudication and off-campus reporting process (if desired by the survivor)
- Case management

Connect with the CARE Advocates at Surge 384 & Surge 386, (951) 827-6225 or

**ADVOCATE@UCR.EDU »**

- **DEAN OF STUDENTS OFFICE »**

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- **EMPLOYEE AND LABOR RELATIONS (STAFF) »**

Human Resources offers several programs and services to the University community. Employee and labor relations is one of the many programs offered by the Human Resources department at the University of California, Riverside.

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- **EQUAL EMPLOYMENT AND AFFIRMATIVE ACTION »**

The office of Faculty & Staff Affirmative Action Equal Employment and Affirmative Action at UCR provides comprehensive services to the campus addressing questions and concerns regarding equal employment opportunity and affirmative action in employment.

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- **HATE BIAS RESPONSE TEAM »**

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- **OMBUDSPERSON'S OFFICE »**

The Ombudsperson is an independent, neutral, and confidential resource for conflict resolution. The Ombudsperson serves the entire campus community - students, staff, faculty, applicants, parents, administrators - by helping to resolve complaints, by providing information and referrals, and by making recommendations for constructive change.

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- **HELP AT UCR »**

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- **STUDENT CONDUCT (STUDENT) »**

Student Conduct and Academic Integrity Programs is responsible for enforcing the University of California Policies Applying to Campus Activities, Organizations and Students.

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- **TITLE IX SEXUAL HARRASSMENT »**

The Title IX/Sexual Harassment Office is responsible for monitoring and evaluating campus efforts to meet the provisions of Title IX of the Educational Amendments of 1972 and Title VII of the Civil Rights Act of 1964.

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- **UC SYSTEMWIDE INTOLERANCE REPORT FORM »**

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- **WHISTLEBLOWER/WHISTLEBLOWER PROTECTION COMPLAINT »**

Faculty, staff, and students may report allegations of suspected improper governmental activities - violations of state or federal laws, regulations, or Executive orders or activities that involve gross misconduct, incompetency or inefficiency. Whistleblowers are protected from retaliation under UC Policy.

UC Whistleblower Hotline: (800) 403-4744

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