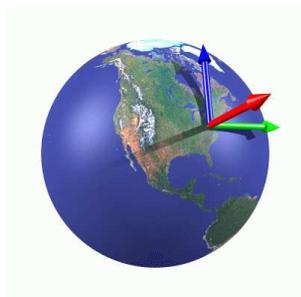


Multivariable Calculus Math 21a, Oliver Knill, Spring 2006



All the course information is on the Math 21a website. Here is a summary of the most crucial information.

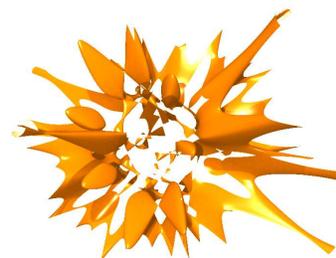
Key information

- **URL:** <http://www.courses.fas.harvard.edu/~math21a/>
- **Classes:** MWF 10-11, 11-12, 12-1 (*), TTh 10-11:30, 11:30-1
- **Sections:** regular, biochem and physics (with sufficient enrollment)
- **Course head:** Oliver Knill, 434 Science Center, knill@math.harvard.edu
- **Office hours:** TBA
- **Book:** J. Stewart, Multivariable calculus, Third edition
- **Additional Biochem Book:** Y.Z. Rozanov, Probability theory, Dover
- **Math question center:** Science Center 309, Su-Th 8-10PM
- **Course assistants:**, TBA
- **Problem sessions:** will be organized by CA
- **Homework:**, weekly HW will be assigned in three parts, one in each lecture. No homework extensions. Lowest HW score of 1 week HW is discarded.
- **Homework:** is due at the beginning of each lecture.
- **First hourly:** March 14, Hall D, 7-8:30 PM
- **Second hourly:** April 18, Hall D, 7-8:30 PM
- **Final:** organized by registrar, time to be announced
- **Mathematica:** program and project will be available on the website
- **Grades:**

Midterm 1:	15
Midterm 2:	15
Homework :	25
Project :	5
Final :	40

Calendar:

Su	Mo	Tu	We	Th	Fr	Sa	week	special dates	month
			1	2	3	4			Feb
5	6	7	8	9	10	11	1	6/7 start of lectures	
12	13	14	15	16	17	18	2		
19	20	21	22	23	24	25	3	20.Feb Presidents day	
26	27	28	1	2	3	4	4		Mar
5	6	7	8	9	10	11	5		
12	13	14	15	16	17	18	6	March 14. First hourly	
19	20	21	22	23	24	25	7		
26	27	28	29	30	31	1		Spring recess	Apr
2	3	4	5	6	7	8	8		
9	10	11	12	13	14	15	9		
16	17	18	19	20	21	22	10	April 18. Second hourly	
23	24	25	26	27	28	29	11		
30	1	2	3	4	5	6	12		Mai
7	8	9	10	11	12	13		Reading period	
14	15	16	17	18	19	20		17. end reading period	
21	22	23	24	25	26	27		26. End exam period	



Sectioning:

- From a **Windows computer**, open the SecureCRT application. Use the "Quickconnect" menu to open a connection with protocol **ssh2**, hostname: **ulam.fas.harvard.edu** and username: **section**.
- From a **Macintosh with OS X** start the "Terminal" application located under Applications/Utilities. At the shell prompt, type **"ssh section@ulam.fas.harvard.edu"** and type return.
- Using any terminal on a **Linux** or any other computer running a **Unix flavour**, login into your FAS account. At the shell prompt, type **"ssh section@ulam.fas.harvard.edu"** and type return.

Daily Syllabus

Hour	Topic	Book section	Tue	Thu
1. Geometry of Space 2/6-2/11				
1	- coordinates	9.1		1
	- distance			
2	- vectors	9.2	++	
	- dot product	9.3		2
3	- cross product and planes	9.4		
2. Functions and Graphs 2/13-2/18				
1	- lines and planes	9.5		
	- distance formulas			1
2	- functions	9.6	++	
	graphs			
3	- level curves			2
	- quadrics			
3. Curves 2/20-2/25				
- Presidents day, no class				
1	- curves in space	10.1		1
	- velocity			
	- acceleration	10.2		
2	- arc length	10.3	++	2
	- curvature	10.4		
4. Surfaces 2/27-3/3				
1	- cylindrical coordinates	9.7		1
	- spherical coordinates			
2	- parametric surfaces	10.5	++	2
3	- functions	11.1		
	- continuity	11.2		
5. Functions 3/6-3/10				
1	- partial derivatives	11.3		
	Solutions to PDE's			1
2	- linear approximation	11.4	+	
	tangent planes			
3	- chain rule	11.5		2
	implicit differentiation			
6. Gradient 3/13-3/17				
1	- review for first hourly			1
2	- gradient	11.6	++	
	gradient and level curves			2
3	- directional derivative	11.6		
	direction of steepest decent			
7. Extrema 4/3-4/7				

1	- maxima, minima, saddle points	11.7		1
2	- Lagrange multipliers	11.8	++	
3	- Combined problems	11.8		2

Spring recess

8. Double Integrals 4/10-4/14				
1	- double integrals	12.1/2		1
2	- general regions	12.3	+	
3	- polar coordinates	12.4		2

9. Surface Area 4/17-4/21				
1	- review for second hourly			1
2	- surface area	12.6		
3	- triple integrals	12.7		2

10. Triple and line Integrals 4/24-4/28				
1	- cylinder, spherical coordinates	12.8	++	1
2	- vector fields	13.1	+	
3	- line integrals	13.2		2

This is the syllabus for the regular and physics sections.

11. Integral Theorems I 5/1-5/5				
1	- fundamental thm line integrals	13.3		1
2	- Greens theorem	13.4	++	
3	- curl and divergence	13.5		2

12. Integral Theorems II 5/8-5/12				
1	- flux integrals	13.6		1
2	- Stokes theorem	13.7	++	
3	- Gauss theorem	13.8		2
	- Applications	13.9		
Mathematica project due!				

The Biochem section roughly part of the fist 5 chapters in Rozanov.

11. Probability theory I (5/1-5/5) biochem				
1	- discrete random variables	1-4		1
2	- continuous random variables	7		
	distributions		+	2
3	- expectation, variance etc	8-9		

12. Probability theory II (5/8-5/12) biochem				
1	- independence, conditional probab.	5+6		1
2	- binomial and Poisson distributions	10	+	
3	- normal distributions	11		2
Mathematica project due!				