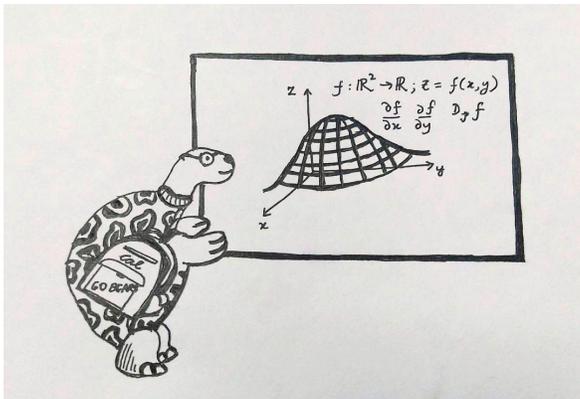# Math 53: Multivariable Calculus. Spring 2018.

Course description: Vectors in 2- and 3-dimensional Euclidean spaces. Parametric equations and polar coordinates. Partial derivatives. Multiple integrals. Vector calculus. Theorems of Green, Gauss, and Stokes.

Instructor: Nikhil Srivastava, email: *firstname at math.obvious.edu*

Please come to office hours or consult with your GSI **before** sending me email about logistical concerns. As far as possible, please use Piazza for mathematical questions.

Lectures: Tuesday and Thursday 5:10-6:30pm, 155 Dwinelle.

Office Hours: Tuesday 6:45-8:00pm and Wednesday 1:15-3:00pm in 1035 Evans.

Course Control Number: 31371

Piazza: Sign Up.

Enrollment Issues: Unfortunately, I have no control over enrollment issues. As far as possible, use CalCentral to handle enrollment issues. If you have any concerns about the waitlist, switching sections, and so on, please contact the registrar or one of the Mathematics undergraduate advisors: Thomas Brown, 965 Evans and Jennifer Sixt Pinney, 964 Evans.

Graduate Student Instructors, and office hours.

- Aaron David Doman, adoman@b.edu, 4:00-5:00 in 836 Evans on Mondays and Fridays.
- Calvin Mcphail-Snyder, cmcphailsnyder@b.edu, 3-4:30 Wednesdays and 12-1 Fridays in 1044 Evans.
- Daniel Chupin, daniel_chupin@b.edu, 840 Evans, Monday 5-6pm and Friday 4-5pm.
- Michael B. Smith doctorq@b.edu, 1010 Evans, 1 pm Mon Wed Fri.
- Patrick F. Wilson patrickfw@math.b.edu, 3-4 pm on Mondays and 2-3 pm on Fridays in Evans 1039.
- Ritwik Ghosh ritwikghosh@b.edu, Tuesday 11-1 in 860 Evans.
- Shiyu Li jjl2357@b.edu, Fridays 3-4 and Mondays 11-12 in 1040 Evans.
- Yong Liang yong.liang@b.edu, 10-11AM Monday and Wednesday in 135 Hesse Hall.
- Zhengyi Zhou zhengyizhou@b.edu, 3-4PM Monday and Friday in Evans 789.

Student Learning Center The Student Learning Center offers a study group for Math 53: http://slc.berkeley.edu/math-53

Textbook: Stewart, *Multivariable Calculus: Early Transcendentals,* UC Berkeley custom edition, 8th edition, Cengage Learning. (ISBN: 978-1-305-75645-8)

Grading: 5% HW, 15% quizzes, 20% x 2 midterms, 40% final. The bottom two HW and Quiz grades will be dropped, and the lower midterm score will be replaced by the final, if it helps. All exams will be curved. The median grade will be **at least** a B-. This is not an upperbound; if everyone does extremely well, I will be happy to give everyone an A+.

Exams: There will be two in-class midterm exams on **Thursday, Feb 22**, and **Thursday, April 12**. There will be no makeup exams, except for documented medical emergencies.

Quizzes will be held in section every **Wednesday**. They will cover material up to the preceding Thursday. The quizzes will be substantially easier than the exams, are and designed to regularly check basic understanding of the material, so that you know in case you are falling behind.

Homework will be assigned daily (problems from the textbook) on this webpage, and each week's homework will be collected the following **Wednesday** in section. Homework will be coarsely graded based on spot checks. You are free (and even encouraged) to talk to your classmates about the homework, but you must write up your own solutions. There is no point copying solutions from the internet since homework is mainly for your own benefit (and worth only 5%), and without working on problems you are likely to lose a lot more than that on the final.

1. [Homework 1 Solutions](#)
2. [Homework 2 Solutions](#)
3. [Homework 3 Solutions](#) and [drawings](#)
4. [Homework 4 Solutions](#)
5. [Homework 5 Solutions](#) and [drawings](#)
6. [Homework 6 Solutions](#)

Announcements

- (1/24) My office hours today will be 3-4:45pm (instead of 1:15-3pm), in 1035 Evans.
- (2/16) [Practice Midterm 1](#) and [list of topics](#).
- (2/20) [Practice Midterm 1 Solutions](#)
- (2/26) [Midterm 1](#) and [solutions](#).
- (2/28) [Midterm 1 Statistics](#)

Class Schedule

This course covers a lot of material very quickly, and in order to digest it I highly recommend reading (or even skimming) the assigned sections **before** lecture. The content of the course is divided into four parts:

1. **Geometric Preliminaries**, Lectures 1-4.
2. **Differentiation**, Lectures 5-11.
3. **Integration**, Lectures 13-18.
4. **Vector Calculus** Lectures 19-26.

#	Date	Topics	Readings	Homework problems	Remarks
1	T 1/16	intro, vectors, dot product	12.1, 12.2, 12.3	12.1: 3, 19, 21, 25, 29. 12.2: 2, 3, 8, 26, 12, 41, 43, 47.	

				12.3: 1bdf, 11, 23a, 27, 55, 63, 64.	
2	Th 1/18	cross product, determinant, lines and planes	12.4, 12.5	12.4: 10, 13, 20, 29, 44, 48, 53. 12.5: 4, 20, 26, 31, 35, 48, 61, 65.	
3	T 1/23	parameterized curves, vector-valued functions	10.1, 10.2, 13.1	10.1: 10, 22, 24, 25, 26, 28, 43. 13.1: 4, 16, 21-26, 28, 32, 42.	skip areas in 10.2
4	Th 1/25	calculus with vector-valued functions	13.1, 13.2, 13.3	13.1: 41, 50, 53x. 13.2: 3, 19, 27, 28, 33, 44, 45x, 56. 13.3: 5, 11, 16.	x means optional. skip curvature and normal/binormal vectors in 13.3.
5	T 1/30	functions of many variables, limits and continuity	14.1, 14.2	14.1: 14, 30, 32, 36, 38, 46, 54, 61-66, 71, 72. 14.2: 7, 9, 13, 28, 33, 45x, 46x.	
6	Th 2/1	partial derivatives, tangent planes, linear approximation	14.3, 14.4	14.3: 8, 18, 19, 41, 50, 56, 71, 74ad, 101. 14.4: 3, 13, 19, 31, 42, 46.	skip partial diff eq. for now
7	T 2/6	chain rule	14.5	14.5: 1, 5, 14, 16, 18, 23, 27, 33, 35, 39, 45, 52, 53.	
8	Th 2/8	directional derivative, gradient	14.6	14.6: 7, 9, 24, 27, 34, 39, 40x, 42, 50, 55, 56, 63, 65.	Interactive Demo
9	T 2/13	max/min	14.7	14.7: 3, 7, 14, 15, 31, 34, 41, 44, 51, 52.	
10	Th 2/15	Lagrange multipliers, partial differential equations	14.8	14.8: 1, 3, 11, 16, 23, 29, 30, 31, 37.	skip multiple constraints online demo
11	T 2/20	review, more PDE	handout		
12	Th 2/22	Midterm 1 (in class)			
13	T 2/27	Double Integrals	15.1, 15.2	15.1: 11, 13, 24, 29, 32. 15.2: 3, 15, 19, 24, 25, 31.	

14	Th 3/1	Polar Coordinates	10.3, 10.4, 15.3	15.3: 1,2,4,7,10,12,17,21,22,26,28,32.	
15	T 3/6	Change of Variables in Double Integrals	15.4, 15.9	15.4: 4,8,12 15.9: 2,4,8,12,16,19.	skip change of vars in triple integrals.
16	Th 3/8	Triple Integrals	15.6	15.6: 6, 8, 10, 14, 22, 28, 30, 34.	
17	T 3/13	Cylindrical and Spherical Coordinates	15.7, 15.8	15.7: 4,8,12,20,28,30. 15.8: 4,8,12,20,26,28,36,42.	
18	Th 3/15	Vector Fields and Line Integrals	16.1, 16.2	16.1: 6,11-14,15-18,26,29-32. 16.2: 17,18,19,20,32a,50,52x.	
	Th 4/12	Midterm 2 (in class)			
	F 5/11	Final Exam (11:30am-2:30pm, 155 Dwinelle)			