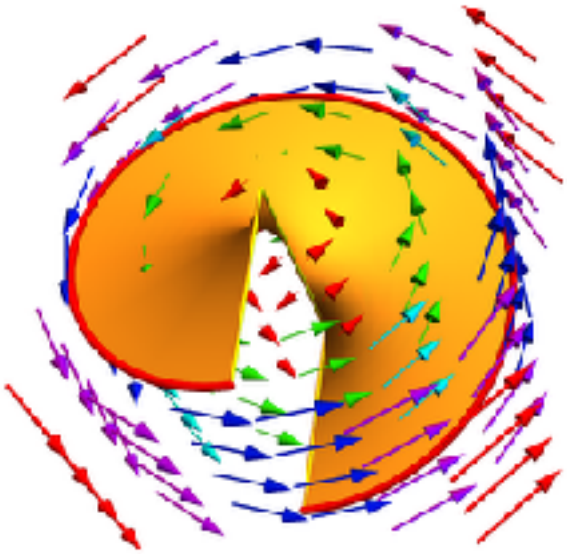

Textbook

James Stewart, Multivariable Calculus is a popular side reading for this course. Any edition works.

Organisation

Course head: Oliver Knill

knill@math.harvard.edu

SC 432, Tel: (617) 495 5549

Mathematica

We have a computer algebra project in this course. Harvard has a site license for Mathematica. It is a professional and powerful software.

Sections

The course lectures (except reviews and intro meeting) are taught in sections. This assures you can discuss the material in class. Additional problem sessions are offered too. Lecture sections meet at:

MWF 9,MWF 10:30,MWF 12, MWF1:30, MWF 3. Please section for one.

MQC

Sun to Thu in 309, 8:30-10:30PM

Exam Dates

1.Exam	2.Exam	Final
Oct 1	Nov 5	December
6 PM	6 PM	TBA
Hall C	Hall C	TBA

Grades

Part	Percentage
1. Hourly	15
2. Hourly	15
Homework	25
Mathematica	5
Final	40

Harvard University Fall 2019

Math 21a

Syllabus 2019

This standard multivariable calculus course extends single variable calculus to higher dimensions. It provides a vocabulary for understanding fundamental processes like weather, planetary motion, waves, heat and analysis in finance, life and social sciences. It teaches important background needed for statistics, computer graphics, bioinformatics, etc. It provides valuable tools for visualization as we study curves, surfaces, solids and other geometrical objects in two and three dimensions. It develops methods for solving optimization problems with and without constraints. You learn a powerful computer algebra system. The course enhances problem solving skills and prepares you for further study in any other fields of mathematics and its applications.

Calendar

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30	31	1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
1	2	3	4	5	6	7
8	9	10	11	12	13	14

Syllabus

1. Vectors and Products

1 coordinates and distance

2 vectors and dot product

3 cross product lines/planes

2. Functions and curves

4 level surfaces quadrics

5 curves, velocity acceleration

6 arc length, curvature

3. Coordinates and Surfaces

7 cylindrical coordinates

8 spherical coordinates

9 parametric surfaces

4. Partial derivatives

* review for first hourly

first midterm (week 1-3) Oct 1

10 continuity

11 partial derivatives

5. Linear approximation

12 partial differential equations

13 linear approximation

14 chain rule implicit differentiation

6. Gradient

* Indigenous people day (no class)

15 tangent spaces

16 directional derivative

7. Extrema

17 maxima, minima, saddle points

18 Lagrange multipliers

19 global extrema

8. Double integrals

20 double integrals

21 polar integration

22 surface area

9. Triple integrals

* review for second midterm

second midterm (week 5-8) Nov 5

23 triple integrals

24 spherical integrals

10. Line integrals

25 vector fields

26 line integrals

27 line integral theorem

11. Stokes theorem

28 Greens theorem

29 curl, divergence and flux

30 Stokes theorem

12. Divergence theorem

31 Divergence theorem

2 Thanksgiving (no class)

3 Thanksgiving (no class)

13. Overview

32 Overview , Outlook

Reading period (2-8) and Exam period (9-20)