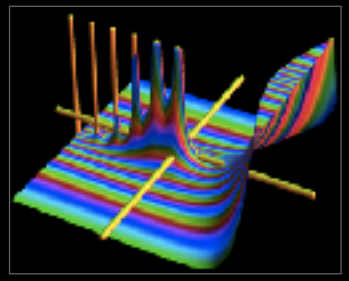
Math-
22B 2022

This vector calculus and linear algebra course is a more mathematical approach in which some linear algebra is integrated. The material and time commitment is similar to 21a but it also gives a gentle introduction to proofs. Vector calculus and linear algebra provides a vocabulary for understanding fundamental processes of nature like weather, planetary motion, waves, diffusion, finance, or quantum mechanics. It helps to visualize processes and data. It teaches important background needed for statistics, discrete mathematics, computer graphics, bio medical sciences, bio-informatics or economics. It provides tools for describing curves, surfaces, solids and other geometrical objects in space. It develops methods for solving optimization problems with and without constraints. The course will enhance problem solving skills and prepares you for further study in other fields of mathematics and its applications.

Lectures

Mo/We/Fr 12-1:15

1.Exam	2.Exam	Final
Feb 28 in class	Apr 4 in class	May Exam Period
Usual classroom	Usual Classroom	TBD



Part	Grade
1. Hourly	20
2. Hourly	20
Homework	20
Proofs	10
Final	30

Accessibility

We are committed to an accessible academic community. For details see the Accessibility Office.

Text

The handouts and lectures are all you need.

Organisation

Oliver Knill, SC 432

knill@math.harvard.edu,

Academic Integrity

We strictly follow the Harvard College school policies. Students are responsible to know the rules and guidelines.

Prerequisites

Arithmetic,Algebra,Geometry Trig, Exp and Log, Single Variable Calc

CALENDAR

SU	MO	TU	WE	TH	FR	SA
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	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

Exams Start/Stop

1. Week: Vectors and Matrices

Unit 1 Pythagoras

Unit 2 Gauss-Jordan

Unit 3 Theorems and Proofs

2. Week: Area and Volume

Unit 4 Cross product

Unit 5 Surfaces

Unit 6 Visual Proofs

3. Week: Length and Curvature

Unit 7 Curves and Length

Unit 8 Curvature

Unit 9 Intuition

4. Week: Parametrizations

Unit 10 Other coordinates

Unit 11 Parametrizations

Unit 12 Creativity

5. Week: PDE's

Unit 13 Partial differential equations

Unit 14 Review

Unit 15 Contraction

6. Week: Taylor

Unit 16 First hourly

Unit 17 Taylor formula

Unit 18 Magic

7. Week: Extrema

Unit 19 Extrema

Unit 20 Lagrange

Unit 21 Islands

SYLLABUS

8. Week: Double integrals

Unit 22 Double integrals

Unit 23 Other coordinates

Unit 24 How to Solve

9. Week: Integration

Unit 25 Triple integrals

Unit 26 Vector fields

Unit 27 Archimedes

10. Week: Line integrals

Unit 28 Second hourly

Unit 29 Line integrals

Unit 30 Perpetual motion

11. Week: Integral Theorems 1

Unit 31 Green's Theorem

Unit 32 Curl and Flux

Unit 33 Discrete vector calculus

12. Week: Integral Theorems 2

Unit 34 Stokes theorem

Unit 35 Gauss Theorem

Unit 36 General Stokes

13. Week: New worlds

WEBSITE

math.harvard.edu/~knill/teaching/math22b2022