

Math 32BH: Calculus of Several Variables, Honors

Winter 2022, Lecture 1

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Content Office Hours: Wednesdays 10-11am, Fridays 10-11:30am, MS 6324; or by appointment
Social/Guest Office Hours: Thursdays 1-2pm, via Zoom

“It seems to me that the poet has only to perceive that which others do not perceive, to look deeper than others look. And the mathematician must do the same thing.” — Sofya Kovalevskaya

Contents

Course Description	2
Textbooks	2
Objectives	2
Course Structure	3
Assignment Types	3
Exams	4
Grades	4
Policies	5
Student Conduct / Classroom Environment Policy	5
Covid-19 Policy	6
Attendance Policy	7
Late/Missed Assignment Policy	7
Regrading Policy	7
Office Hour Policy	8
Contact / Email policy	8
Resources	8
Services for Students with Disabilities	8
Further Resources	8
Title IX	9

Course Description

Math 32AB is a traditional multivariable calculus course sequence for mathematicians, engineers, and physical scientists. Math 32B treats topics related to integral calculus in several variables.

The course 32BH differs from 32B in that it covers the topics of multivariable calculus with more mathematical rigor. Moreover, it builds the foundation for more advanced topics, such as real analysis, complex analysis, and differential geometry. This course is recommended for students interested in pursuing advanced mathematics.

The dates and topics in this syllabus are subject to change. Any changes will be announced on [Canvas](#).

Prerequisites

Math 31B (Differential and Integral Calculus) with a grade of B or better.

Math 32A (Multivariable Differential Calculus) with a grade of B or better.

Textbooks

- *Calculus and Analysis in Euclidean Space*, by Shurman.
- *Multivariable Calculus and Differential Geometry*, by Walschap.
- *Vector Calculus, Linear Algebra, and Differential Forms: A Unified Approach*, by Hubbard and Hubbard.

The official course textbook is *Calculus and Analysis in Euclidean Space*, by Shurman. Homework will be assigned directly from this book. If you choose to get a different edition, or to not get the book at all, it is your responsibility to figure out the correct problems.

However, I will also be drawing materials and problems from both Walschap and Hubbard and Hubbard as well. You might find it convenient to obtain copies of these books for reference.

Furthermore, you may find it helpful to read the relevant chapter or section *before* coming to lecture, even if you do not understand everything the first time through.

Objectives

"In mathematics, the art of asking questions is more valuable than solving problems." — Georg Cantor

The goals of the course are that you:

- (1) acquire an understanding of the geometry of curves, surfaces, and manifolds, the integral calculus of multivariable functions and vector fields, and integration on manifolds via differential forms;
- (2) develop the questioning, reasoning, and proof skills needed to explore mathematical ideas and topics, and to apply them to real-life situations;
- (3) develop the collaboration and communication skills needed to convey your (mathematical) ideas.

Furthermore, this course is designed to show you that mathematics is neither a “spectator sport”, nor a solitary endeavor. Mathematics is both a creative and a collaborative process, and *everyone*, especially you, can do mathematics and be a part of the mathematical community. My hope is that by the end of the semester, you will be proud of the mathematics that you have done in this course.

“I don’t solve quadratic equations to help me with my daily life, but I do use mathematical thinking to help me understand arguments and to empathize with other people. And so pure maths helps me with the entire human world.” — Eugenia Cheng

Course Structure

“The only way to learn mathematics is to do mathematics.” — Paul Halmos

This course is offered in an in-person, synchronous format. Lectures and discussion sections will be held in person. Lectures will be recorded via Zoom. Office hours will be held both in person and virtually.

Course materials, including recorded class lectures and lecture slides, will be made privately available on [Canvas](#). We will also use Slack as a tool for asking and answering questions, as well as working collaboratively.

During class lectures, I plan to use a mix of direct teaching (aka traditional lecturing), as well as active and inquiry-based teaching. Tasks you will be asked to do include: work individually, work in small groups, discuss ideas in small groups, ask questions, and/or present your ideas or solutions to the class. The format of the discussion sections are largely left to the individual TAs.

Assignment Types

1. **Homework:** Each lecture will have accompanying homework problems assigned from the book. These are chosen to help you best understand the material. You are encouraged to work together on the homework problems. **Homework will not be collected.**
2. **Quizzes:** There will be a total of 7 two-part cumulative quizzes given during the discussion sections. In the first part, you will attempt the quiz individually, without any outside resources. In the second part, you will work on the quiz in small groups, with any resources at your disposal. You will submit both parts of the quiz to be graded, but **only the group quiz will count towards your course grade.**

The problems will cover topics from any past lecture or homework assignment. The individual part is designed to help you assess your current understanding of the material. The group part is designed to help you learn and master the material, as well as develop your mathematical communication skills.

3. **Challenge Problems:** There will be a total of 4 “Challenge Problem” sets given during the discussion sections. These problems will be more challenging than typical homework problems. You will start working on these in small groups, and you will have roughly a week before you individually submit a polished write up of your solutions.

These challenge problems are designed to both help you develop both your mathematical reasoning and communication skills.

4. **End of Quarter Reflection:** This is an **optional** writing assignment to be submitted before the final exam. It is designed for you to reflect on what you have learned and achieved in this course.

If you complete this assignment and your course grade is close to a higher grade bracket, I will additionally take into account how thorough, detailed, and thoughtful your responses are to this assignment when assigning a letter grade. Otherwise, your final grade will be determined as outlined below. Your grade will never be lowered by this assignment.

Exams

There will be two non-cumulative 50-minute midterms, and one cumulative 3-hour final. The midterms will be held in-person, during lecture. The final exam will also be held in-person.

You must bring a photo ID to the exams. Calculators will not be allowed on exams. The topics covered on the midterms depends on the schedule, and will be announced one week in advance of the midterm.

For each exam, you will be allowed to bring a handwritten reference sheet. For the midterms, the reference sheet must be written on a single 3" x 5" index card (double-sided). For the final, the reference sheet may consist of one side of a single 8.5" x 11" sheet of paper. Sheets that do not meet these requirements will be confiscated at the beginning of the exam.

Midterm 1	Friday Jan 28	9-9:50AM	MS 5127
Midterm 2	Friday Feb 25	9-9:50AM	MS 5127
Final	Tuesday March 15, 2022	8-11AM	TBD

It is okay to ask for an alternate examination time, e.g. if you have a course conflict. I will do my best to accommodate alternate examination times. If you have a conflict, please let me know ASAP, **up to two weeks in advance of the exam**, so I can take care of the logistics.

If you miss a midterm, then your grade will automatically be computed by scheme 2 as outlined below. **You must take the final exam in order to pass the course.** The UCLA student handbook outlines when a make-up final exam is permitted.

If you are sick, or need to quarantine during an exam period, you should not come to the exam. You should let me know ASAP, and we will proceed on a case-by-case basis.

Grades

"You need to have a conversation with yourself about what is important for you, what you actually need to thrive. And to not fall prey to the belief system that the only thing of value is your mathematics." —

Pamela Harris

Your grade will reflect your performance in the course using the **better** of the following two grading schemes:

<u>Scheme 1</u>		<u>Scheme 2</u>	
Quizzes	28%	Quizzes	28%
Challenge Problems	24%	Challenge Problems	32%
Midterm 1	12%	Best Midterm grade	12%
Midterm 2	12%		
Final	24%	Final	28%

A letter grade will be assigned to percentages via the following brackets.

A	A-	B+	B	B-	C+
[100, 93]	(93, 90]	(90, 87]	(87, 83]	(83, 80]	(80, 77]
C	C-	D+	D	D-	F
(77, 73]	(73, 70]	(70, 67]	(67, 63]	(63, 60]	(60, 0]

Borderline grades may be improved by submitting the **End of Semester Reflection** as outlined above. I reserve the right to award an A+ for exceptional performance. I also reserve the right to adjust the grade cutoffs dependent on overall class scores at the end of the semester. This will only ever make it *easier* to obtain a certain letter grade.

Policies

Student Conduct / Classroom Environment Policy

Everyone can have joyful, meaningful, and empowering mathematical experiences. — Federico Ardila

I strongly believe that EVERYONE is capable of success in this course and in mathematics in general, regardless of the systemic barriers that exist due to race, gender, socio-economic background, or cultural identity.

In fact, I hope to show you all that mathematics can be inspiring, affirming, and even empowering. I strive to create positive and inclusive learning environments where all students feel welcome to ask questions and to voice their ideas. In particular,

- **You belong in this classroom.** Discrimination or harassment of any kind will not be tolerated. Please let the instructor know immediately if you ever feel uncomfortable in class. You may report an incident to the Office of Equity, Diversity and Inclusion [here](#).
- **You deserve to be addressed in the manner that reflects who you are.** If you are comfortable with it, you are welcome to share your pronouns and/or preferred name at any time. Conversely, please address your classmates according to their expressed preferences.
- **You deserve to fully and equitably participate in our learning environment.** During class, I encourage you to interrupt me with questions at any time, but you may also ask questions in the public Zoom chat or via private message. Please let me know as soon as possible if you need any classroom accommodations.
- **Be comfortable with asking questions and making mistakes.** Doing so is an essential part of the learning process, and no question is too basic or stupid. I ask you all to respect and be patient with your peers when they are confused.

While studying mathematics can often be challenging intellectually, it can be challenging *emotionally* as well. In my experience, having a strong support network of teachers, mentors, colleagues, peers, and friends that can support you is the best way to help you persevere and succeed in mathematics. To help build an empathetic support network in class, I ask that you all:

- Reach out to people you do not know and actively build new connections;
- Respect and understand that different people may bring differences in background, expertise, and interest;

- Assume the best in others and give them the benefit of the doubt. However, understand that behavior can have an adverse impact on others, even in the absence of malicious intent.
- Do not interrupt your peers; demean them or their ideas; or challenge their competence or mathematical abilities.

Covid-19 Policy

Ensuring a safer campus depends on each of us following the latest UCLA health and safety guidelines. While campus policies must be modified to address changing local, state, and national orders and guidance, the most current information is available at covid-19.ucla.edu.

At present, each of us:

- Is responsible, regardless of vaccination status, for wearing an approved mask that fully covers our nose and mouth for the duration of class, office hours, or other course-related activity.
 - Disposable masks are available at the Wooden Center. I and your TAs will bring a box of masks to class, discussion section, and office hours.
 - Appropriate masks include two-ply woven fabric masks, surgical masks, non-woven KN95 masks, and N95 respirators.
 - Please note that scarves, balaclavas/ski masks, single-layer fabric masks and neck gaiters, bandanas, and turtleneck collars are not compliant.
 - For those that have a disability-related reason not to wear a mask, you can contact the [Center for Accessible Education \(CAE\)](#) to obtain an approved accommodation and any appropriate alternative mitigation measures to be sent to instructors.
- Must be fully vaccinated or have submitted an exception request. Per the COVID-19 Response and Recovery Task Force, unvaccinated students with pending or approved exceptions must comply with [twice-weekly testing](#).
- Is required to complete [daily symptom checks](#) prior to coming to campus, regardless of vaccination status, and must stay home if you are not cleared by the symptom survey and/or are advised by the Exposure Management Team to quarantine or isolate.
- Will refrain from eating meals in the classroom, except for those with approved accommodations. If you need to eat or drink something for medical reasons, please do so quickly and then put on your mask.

Be advised that refusal to comply with current campus directives related to COVID-19 mitigation may result in dismissal from the classroom, referral to the Office of Student Conduct, and/or cancellation of lecture, discussion section, or office hours.

Calculator Policy

You are welcome to use calculators or [Wolfram Alpha](#) (a free online calculator) on homework, group quizzes, and challenge problems. However, no calculators will be allowed on any of the exams (or individual quizzes) in this course. You are expected to be able to perform basic arithmetic operations with fractions and decimals by hand, and know common values of trigonometric and log functions.

Attendance Policy

Attendance at our MWF lectures and discussion sections is strongly recommended, and is required in the sense that assignments that affect your grade will be given. Consistently attending lecture will ensure that you do not fall behind in class.

If you happen to miss a class or a discussion section for whatever reason, see the late/missed assignment policy.

Late/Missed Assignment Policy

Sometimes we have bad days, bad weeks, or bad semesters. This is especially true in light of the COVID-19 pandemic, and this crisis, as well as any other unexpected, unfortunate personal crisis, should not unduly affect your grade. However, if you are having consistent problems keeping to the schedule, you should reach out to me.

If you happen to miss a **quiz** once or twice, you should contact your TA **before the next discussion section** to make up the quiz. This should be during either their in-person office hours or in my in-person office hours. You will take both parts as usual. Note that for the group part, you will have your resources and any peers that are also making up the quiz.

For **challenge problems**, I am using the policy of “time banks” to accommodate any unexpected issues. You may use this policy one of two ways (please choose, and let me know):

- You may have 1 two-day grace period for one submitted assignment, OR
- You may have 2 one-day extensions for two different submitted assignments.

You do not have to justify your use of this policy, nor do you need to use it at all. However, if you find yourself struggling with unexpected personal events, I encourage you to email me (richardwong@math.ucla.edu) as soon as possible. I also give case-by-case flexibility depending on the severity of the issues.

Regrading Policy

Occasionally, I, your TAs, or the graders may make a mistake while grading assignments or exams. If there has been a clerical error (e.g. there was an error in calculating the points you earned, or an error in recording the grades on Canvas), you can contact me or the TAs immediately to fix this error.

For all other grading issues, you should submit a Request for Regrade Form to Canvas any-time within the regrading window for the assignment. Unless announced otherwise, this window lasts for one week, beginning 24 hours after the assignment or exam has been returned.

Please note that the regrading policy is intended to fix serious errors in grading, *not* to argue for extra points. Your grade will not necessarily be improved by the regrade.

Academic Integrity

UCLA is a community of scholars. In this community, all members including faculty, staff and students alike are responsible for maintaining standards of academic honesty. As a student and member of the University community, you are here to get an education and are, therefore, expected to demonstrate integrity in your academic endeavors. You are evaluated on your own merits. Cheating, plagiarism, collaborative work, multiple submissions without the permission

of the professor, or other kinds of academic dishonesty are considered unacceptable behavior and will result in formal disciplinary proceedings usually resulting in suspension or dismissal. See the [Dean of Students website](#) for more information.

Office Hour Policy

Office hours will be held both in person and virtually. In addition to the traditional "course content" office hours, I will also hold "social" office hours for you to get to know me, your classmates, your peers at UCLA, and (occasionally) professional mathematicians.

You are strongly encouraged to come to office hours, both with me and your TA. You might find the course content office hours most helpful if you have specific questions prepared, but I also welcome you to come and listen to your peers' questions. For the social office hours, there will often be a topic or reading to guide the conversation.

Contact / Email policy

If you have a course-related question, you are strongly encouraged to post in the course Canvas or Slack before emailing me. Others might be able to answer your question, and others might find the answer to your question helpful as well.

Otherwise, the best way to contact me is via email (richardwong@math.ucla.edu). To ensure that I see your email, the subject line should include the phrase "**Math 32BH**". To ensure I know who you are, the message or signature should include **your name** and **UCLA University ID**.

I will do my best to respond to your email in a timely manner (typically within a few hours). However, if you send an email during the evening or the weekend, do not expect to hear a response until the next weekday morning.

Resources

Services for Students with Disabilities

I am committed to creating an accessible and inclusive learning environment. Please let me know if you experience any barriers to learning so that I can work with you to ensure you have equal opportunity to participate fully in this course.

If you are already registered with the Center for Accessible Education (CAE), please request your Letter of Accommodation in the Student Portal. If you are seeking registration with the CAE, please submit your request for accommodations via the CAE website. Students with disabilities requiring academic accommodations should submit their request for accommodations as soon as possible, as it may take up to two weeks to review the request. For more information, please visit the [CAE website](#), visit the CAE at Murphy Hall A255, or contact them by phone at (310) 825-1501.

Further Resources

UCLA provides resources if you are feeling overwhelmed and need personal and/or academic assistance. You can find a [list of resources organized by need here](#).

UCLA has a multitude of groups, resources, and services available to support your academic success, your social belonging, your physical and mental health, and your overall well-being. You can explore [these resources here](#).

If you are experiencing a financial crisis that impacts your academic success at UCLA, the Economic Crisis Response Team (ECRT) may be a helpful resource. ECRT aims to efficiently, compassionately and discreetly offers a seamless and individualized response to UCLA students in extraordinary financial crisis. You may submit a self-assessment form by visiting [this link](#). The self-assessment form will allow the team to assess options and provide resources best suited to address your needs.

Title IX

Please note that Title IX prohibits gender discrimination, including sexual harassment, domestic and dating violence, sexual assault, and stalking. If you have experienced sexual harassment or sexual violence, you can receive confidential support and advocacy at the [CARE Advocacy Office for Sexual and Gender-Based Violence](#), 205 Covel Commons, Los Angeles, CA, 90095; care@careprogram.ucla.edu; (310) 206-2465.

[Counseling and Psychological Services \(CAPS\)](#) provides confidential counseling to all students and can be reached 24/7 at (310) 825-0768.

I am required under the UC Policy on Sexual Violence and Sexual Harassment to inform the Title IX Coordinator should I become aware that you or any other student has experienced sexual violence or sexual harassment. You can also report sexual violence or sexual harassment directly to the University's Title IX Coordinator, 2255 Murphy Hall, titleix@equity.ucla.edu, (310) 206-3417. Reports to law enforcement can be made to UCPD at (310) 825-1491.