MATH 375 - Topics in Multivariable Calculus and Linear Algebra
University of Wisconsin-Madison

Fall 2025 Syllabus

Basic information:
Credits: 5
Instructor: Prof. Saverio Spagnolie
Lecture time/location: TR 1:00-2:15pm / 222 Ingraham Hall
Email: spagnolie@math.wisc.edu
Contact: via PIAZZA (response in under 48 hours) or via email (reponse in under 10 days)
Piazza page (assignments, discussions): `https://piazza.com/wisc/fall2025/math375`
Canvas page (grades): `https://canvas.wisc.edu/courses/466728`

Course description: This course is the third semester of the Calculus Honors sequence developed by the Mathematics Department. The object of the course is to present the subjects of linear algebra and multivariable calculus and the interrelation between their mathematical ideas.

Textbook: Tom M. Apostol, *Calculus - Volume II*, second edition

Quizzes: Every week there will be a short quiz. The quizzes are not meant to be particularly challenging, but are meant to help keep you on task for attending class, doing the reading, and paying attention to the coursework. Your lowest quiz score will be dropped.

Exams: Two midterm exams will be held during the evening, and will be advertise multiple weeks beforehand. A final exam will be held on Wednesday, Dec. 17, 2025, from 10:05am-12:05pm. The location will be announced. By signing up for this course you are agreeing to take the midterm and final exams. You must contact the instructor in the first 2 weeks of the semester if you have a conflict with the scheduled exam times.

Homework: Homework will be assigned weekly. Homework sets will be due at the very beginning of class - no late homework will be accepted.

Homework will be checked for accuracy (15 points) and quality of communication (5 points). You are allowed (and encouraged) to work with others, but you must turn in your own assignment with your own written solutions. Your lowest homework score will be dropped.

Grading: Your grade will be determined by your scores on homework (15%), quizzes (5%) and on the exams (25% for each midterm, and 30% for the final). A final letter grade can be secured with the following scores: A ($> 93\%$), AB ($88 - \%93\%$), B ($83\% - 88\%$), BC ($78\% - 83\%$), C ($70\% - 78\%$), D ($60\% - 70\%$), F ($< 60\%$). It is possible that these bars will be lowered at the end of the semester but they will not be raised (e.g. you are guaranteed at least a B with a score of 83%). Final grades are not otherwise curved.

To provide some cushion for illness and special circumstances, the lowest quiz and homework scores will be dropped.

Attendance and class participation are expected but are not part of the grading.

Electronics policy: Electronics with internet access (phones, laptops) must be turned completely off during class. Taking notes on a laptop will also not be acceptable, barring special accommodations needs through the McBurney Disability Resource Center. I will make course notes available to everyone before each lecture; you are encouraged to print out a copy and bring it with you to class. Let's create a sanctuary together.

AI policy: The goal of the course is to teach you how to think carefully in a particular setting. There is only one way to learn how to play an instrument or sport, or to do math: hard work using your own faculties. It is not easy, but this is the way. You do not need AI for this course.

How to succeed in this course: The obvious things: do everything that is asked, do the assigned reading, show up to class on time with your phone turned all the way off. Less obvious: work with each other on homework sets. To prepare for exams have a classmate quiz you. Not only will you learn what you have and have not mastered this way, the other student will learn by coming up with good questions for you. Then quiz your classmate. The alternative is to learn what you have and have not mastered during the exam.

Course learning outcomes:
By the end of the course you should be able to:

1. Identify the formal definitions of mathematical objects and their properties used in linear algebra and differential multivariable calculus (e.g., vector spaces, linear transformations, derivatives of multivariate functions, etc.).

2. Use the standard methods and tools of mathematical argument in the context of linear algebra and multivariate differential calculus (e.g., direct and indirect methods, the construction of examples and counterexamples, induction arguments, 1st order logic, set theory, quantifiers, etc.).

3. Verify if a mathematical construct does or does not have the condition of having a particular property (e.g., that a matrix is invertible, that a set is a vector subspace, that a vector valued function is differentiable, etc.).

4. Identify standard theorems in linear algebra and differential multivariate calculus and recall arguments for these theorems and the underlying logic of their proofs (e.g., symmetric matrices are diagonalizable, chain rule for multivariate functions, etc.).

5. Prove or disprove statements related to the definitions, properties, and theorems of linear algebra and differential multivariate calculus using the techniques of mathematical argument.

6. Perform standard computations in the context of linear algebra and differential multivariate calculus.

7. Write mathematical proofs and concepts in logical, reasonable, and concise ways.

COVID-19 policies: Students are expected to comply with the University's current COVID rules and policies that are maintained here: `https://covidresponse.wisc.edu` (see in particular `https://covidresponse.wisc.edu/faq/`).

Students who do not comply with these rules can be asked to leave the classroom, and students who repeatedly fail to comply will be referred to the Office of Student Conduct and Community Standards. Any student who requires an exemption to current policies must contact the McBurney Office, as instructors do not have the authority to grant such exceptions.

Anyone experiencing COVID-related symptoms should test and isolate until they receive test results.

If you are unable to attend in-person class meetings for COVID-19-related reasons (e.g. if you have even mild symptoms, `https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/symptoms.html`) you can let me know on Piazza. I will make course notes and any code presented in class available online throughout the semester so that you can stay with us.

I will do whatever I am allowed to do to provide a safe learning environment for you.

Academic integrity: By enrolling in this course, each student assumes the responsibilities of an active participant in UW-Madison's community of scholars in which everyone's academic work and behavior are held to the highest academic integrity standards. Academic misconduct compromises the integrity of the university. Cheating, fabrication, plagiarism, unauthorized collaboration, and helping others commit these acts are examples of academic misconduct, which can result in disciplinary action. This includes but is not limited to failure on the assignment/course, disciplinary probation, or suspension. Substantial or repeated cases of misconduct will be forwarded to the Office of Student Conduct & Community Standards for additional review. For more information, refer to `studentconduct.wiscweb.wisc.edu/academic-integrity/`.

Privacy: The privacy and security of faculty, staff and students' personal information is a top priority for UW-Madison. The university carefully evaluates and vets all campus-supported digital tools used to support teaching and learning, to help support success through learning analytics, and to enable proctoring capabilities. View the university's full teaching and learning data transparency statement here: `https://teachlearn.provost.wisc.edu/teaching-and-learning-data-transparency-statement/`.

Accommodations for students with disabilities: The University of Wisconsin-Madison supports the right of all enrolled students to a full and equal educational opportunity. The Americans with Disabilities Act (ADA), Wisconsin State Statute (36.12), and UW-Madison policy (Faculty Document 1071) require that students with disabilities be reasonably accommodated in instruction and campus life. Reasonable accommodations for students with disabilities is a shared faculty and student responsibility. Students are expected to inform faculty [me] of their need for instructional accommodations by the end of the third week of the semester, or as soon as possible after a disability has been incurred or recognized. Faculty [I], will work either directly with the student [you] or in coordination with the McBurney Center to identify and provide reasonable instructional accommodations. Disability information, including instructional accommodations as part of a student's educational record, is confidential and protected under FERPA. (See: McBurney Disability Resource Center) `http://mcburney.wisc.edu/facstaffother/faculty/syllabus.php`

Diversity and inclusion: Diversity is a source of strength, creativity, and innovation for UW-Madison. We value the contributions of each person and respect the profound ways their identity, culture, background, experience, status, abilities, and opinion enrich the university community. We commit ourselves to the pursuit of excellence in teaching, research, outreach, and diversity as inextricably linked goals. The University of Wisconsin-Madison fulfills its public mission by creating a welcoming and inclusive commu-

nity for people from every background, people who as students, faculty, and staff serve Wisconsin and the world. `https://diversity.wisc.edu/`

Course Designation:
Breadth - Natural Science
Level - Advanced
L&S Credit - Counts as Liberal Arts and Science credit in L&S
Repeatable for Credit: No
Last Taught: Fall 2024

Requisites: You need credit for Calculus 2 (MATH 222) to enroll in the course. Usually this is by taking MATH 222, transfer credit, or the Calculus BC exam. If you established MATH 222 credit in some other way–such as through A-Level exams–please email enrollment@math.wisc.edu to discuss your eligibility to apply for the sequence. The minimal recommended background for taking the course, however, is the following: a 5 on the BC Calc exam or a 7 on the IB Math with Further Math exam, and/or a high A in your Calculus 2 course.

Earned credit: Each credit is earned as follows: one hour (i.e. 50 minutes) of classroom or direct faculty/instructor instruction and a minimum of two hours of out of class student work each week over approximately 15 weeks, or an equivalent amount of engagement over a different number of weeks. This is the status quo and represents the traditional college credit format used for decades.

Privacy of Student Records & the Use of Audio Recorded Lectures Statement: Lecture materials and recordings for this course are protected intellectual property at UW-Madison. Students in this course may use the materials and recordings for their personal use related to participation in this class. Students may also take notes solely for their personal use. If a lecture is not already recorded, you are not authorized to record my lectures without my permission unless you are considered by the university to be a qualified student with a disability requiring accommodation. [Regent Policy Document 4-1] Students may not copy or have lecture materials and recordings outside of class, including posting on internet sites or selling to commercial entities. Students are also prohibited from providing or selling their personal notes to anyone else or being paid for taking notes by any person or commercial firm without the instructor's express written permission. Unauthorized use of these copyrighted lecture materials and recordings constitutes copyright infringement and may be addressed under the university's policies, UWS Chapters 14 and 17, governing student academic and non-academic misconduct.

Course Evaluations: Students will be provided with an opportunity to evaluate this course and your learning experience. Student participation is an integral component of this course, and your confidential feedback is important to me. I strongly encourage you to participate in the course evaluation.

Digital Course Evaluation (AEFIS): UW-Madison uses a digital course evaluation survey tool called AEFIS. For this course, you will receive an official email two weeks prior to the end of the semester, notifying you that your course evaluation is available. In the email you will receive a link to log into the course evaluation with your NetID. Evaluations are anonymous. Your participation is an integral component of this course, and your feedback is important to me. I strongly encourage you to participate in the course evaluation.

Students' Rules, Rights & Responsibilities:

https://guide.wisc.edu/undergraduate/#rulesrightsandresponsibilitiestext

Academic Calendar & Religious Observances: https://secfac.wisc.edu/academic-calendar/.