Instructor: Clover May
Office: MS 6903
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Office Hours: W 11:30am-12:30pm

Class Meetings: MWF 2:00pm-2:50pm, MS 5117

Course Website: https://ccle.ucla.edu/course/view/19S-MATH115A-5

Prerequisites: C- or better in Math 33A or equivalent.

Textbook: The textbook is *Linear Algebra,* **Custom 4th edition for UCLA** by Friedberg, Insel, and Spence. We will cover roughly Chapters 1, 2, 5, and 6.

Grading: Your grade will be determined as the better of the following two options:

- 10% homework + 35% best midterm grade + 55% final exam
- 10% homework + 25% Midterm 1 + 25% Midterm 2 + 40% final exam

Homework: Written homework assignments will be due each week, usually in discussion on Thursdays. Homework must be written neatly and clearly, using correct notation and complete sentences. You are encouraged to work together on these problems, however you must turn in your own work. **No late homework will be accepted**, but your lowest homework score will be dropped.

Exams: There will be two in-class midterm exams and a cumulative final exam. The schedule for the midterm exams is below. The final exam is scheduled by the registrar.

Midterm Exam 1:	**Monday, April 29**	(Week 5)
Midterm Exam 2:	**Monday, May 20**	(Week 8)
Final Exam:	**Sunday, June 9, 11:30am-2:30pm**	(Week 11)

You must bring your student ID to exams. **There will be no make-up exams**. If you miss a midterm, your grade will be computed by the first rubric. **You must take the final exam as scheduled by the registrar in order to pass the class**.

Course content and goals: This course is an introduction to the rigor of proof-based mathematics via the topic of linear algebra. It will focus on linear algebra in the setting of abstract vector spaces over arbitrary fields. Linear algebra is arguably one of the most useful topics in mathematics, in both pure and applied contexts. As much of mathematics is proof-based, this course also serves as a bridge to more advanced topics in mathematics. Students successfully completing this course will be able to:

- Write coherent, well-organized, and logical proofs using complete sentences.
- Determine whether a list of vectors forms a basis.
- Find the dimension of a vector space or subspace.
- Apply the replacement theorem in context.
- Find the rank and nullity of a linear transformation.
- Apply the rank-nullity theorem in context.

- Find a matrix representation of a linear transformation.
- Determine whether a linear transformation is invertible, and if so find its inverse.
- Find the eigenvalues and eigenvectors of a linear operator.
- Determine whether a linear operator is diagonalizable.
- Work with inner products and norms in real and complex vector spaces.
- Use Gram-Schmidt orthogonalization to find an orthogonal basis for a vector space.
- Define and work with the adjoint of a linear operator.
- State and apply the spectral theorems for real and complex vector spaces in terms of normal and self-adjoint linear operators.

General Expectations/Study Tips:

- *Attendance is mandatory.* You are responsible for any announcements, material, and assignments discussed in class.
- You must show all work and justify your reasoning on homework and exams. If I do not understand what you have written for a problem, you will not get credit for it.
- An atmosphere of mutual respect. In particular, cell phones, tablets, and laptops are to be powered off or silent and put away during class to limit distractions. Please keep talking to a minimum and raise your hand if you have a question.
- Go over your notes after each class. Explain to yourself or someone else what the lecture was about, what the key ideas were, and how the examples work.
- Read ahead in the book. It helps a lot to have already seen the material covered in class, even if you do not understand everything the first time through.
- Form a study group with others in the class. The best way to learn something is to try to explain it to someone else.
- Keep your old homework assignments and exams. Make sure you know how to do each problem correctly and use these for studying for future tests.
- If you are having trouble with the course material, I expect you to ask for help. You are encouraged to come to my office hours and to your TA's office hours.
- If you need to contact me via email you should write **Math 115A** in the subject line or I may not receive it.

Student Conduct: Violations of the student conduct code can result in a failing grade on any course work related to the violation, a failing grade in the course, and/or suspension. Cheating includes, but is not limited to

(a) looking at another student's exam during a quiz or test,
(b) copying the work of another person and submitting it as your own, and
(c) using any materials except those explicitly approved during a test-taking situation.

For more information, see the Student Conduct Code at
https://www.deanofstudents.ucla.edu/studentconductcode.

Accessibility: Students needing academic accommodations based on a disability should contact the Center for Accessible Education (CAE) at (310)825-1501 or in person at Murphy Hall A255. In order to ensure accommodations, students need to contact the CAE within the first two weeks of the term.

Tentative Schedule:

Week	Date	Sections
1	Mon 4/1	1.2: Vector spaces over a field
	Wed 4/3	1.2: Vector spaces over a field, Appendix C: Fields
	Fri 4/5	1.2: Vector spaces over a field
2	Mon 4/8	1.3: Subspaces
	Wed 4/10	1.4: Linear combinations and systems of linear equations
	Fri 4/12	1.5: Linear dependence and linear independence
3	Mon 4/15	1.6: Bases and dimension
	Wed 4/17	1.6: Bases and dimension
	Fri 4/19	2.1: Linear transformations, null spaces, and ranges
4	Mon 4/22	2.1: Linear transformations, null spaces, and ranges
	Wed 4/24	2.2: Matrix representation of a linear transformation
	Fri 4/26	2.3: Composition of linear transformations and matrix mult.
5	**Mon 4/29**	**Midterm Exam 1**
	Wed 5/1	2.4: Invertibility and isomorphisms
	Fri 5/3	2.4: Invertibility and isomorphisms
6	Mon 5/6	2.5: Change of coordinate matrix
	Wed 5/8	4.4: Summary - important facts about determinants
	Fri 5/10	5.1: Eigenvalues and eigenvectors
7	Mon 5/13	5.1: Eigenvalues and eigenvectors
	Wed 5/15	5.2: Diagonalizability
	Fri 5/17	5.2: Diagonalizability
8	**Mon 5/20**	**Midterm Exam 2**
	Wed 5/22	6.1: Inner products and norms
	Fri 5/24	6.1: Inner products and norms
9	Mon 5/27	**Memorial Day** - No class
	Wed 5/29	6.2: Gram-Schmidt orthogonalization and orthogonal comp.
	Fri 5/31	6.2: Gram-Schmidt orthogonalization and orthogonal comp.
10	Mon 6/3	6.3: Adjoint of a linear operator
	Wed 6/5	6.4: Normal and self-adjoint operators
	Fri 6/7	Catch up and Review
11	**Sun 6/9**	**Final Exam**