MATH 3090/6090 – LINEAR ALGEBRA – FALL 2024

DANIEL IRVING BERNSTEIN

Instructor: Daniel Irving Bernstein (pronouns: he or they)
Instructor email: dbernstein1@tulane.edu
Days and times of the lectures: MWF, 1:00pm-1:50pm
Place of the lectures: DW 108
Instructor's office: GI 401 A
Instructor's office hours: MW, 2:00-3:00pm
Recitation leader: Nathaniel Vaduthala
Day and time of recitation: Tuesdays, 9:30am-10:45am
Place of recitation: GI 414

Course description

Linear algebra is the theory necessary to make sense of linear functions of multiple variables and flat geometric objects. Linear algebra is fundamental to *every* area of mathematics, and many areas of science and engineering. If you've studied calculus, you have already seen some indication as to *why* linear algebra is so fundamental: every differentiable function can be approximated by a linear function in a sufficiently small region, and if you zoom in on a smooth object, it starts to look flat (e.g. the Earth's surface).

Compared to other math courses you are likely to have taken, this course will have a greater emphasis on proofs and abstraction and less emphasis on applications. Students who want a more applications-driven course on linear algebra are advised to take Math 2240.

Course goal

One extremely harmful myth in our culture is that math is something only a "genius" can really understand. The result is that many mathematicians have a voice in their head telling them that they aren't smart enough to *really* do math, and any success suggesting otherwise is a fluke. This includes myself and literally everyone I've ever talked to about this, which includes a *lot* of people with PhDs. The truth, at least in my own experience, is that math is like any other skill. Sure, at any given moment, some progress faster and with less effort than others, but this fact gets far more attention than it deserves. Based on my years of experience as a mathematician and educator, I believe that with the right guidance and resources, anyone can get better at math through consistent focused effort, and that doing this over the course of many years will make *anyone* really, really good at math. My ultimate goal in teaching this course is simple: I want to enable you to see your own mathematical potential. I hope to do this by helping you achieve the following:

(1) gain a baseline factual knowledge about systems of linear equations, matrices, determinants, vector spaces, eigenvalues, and eigenvectors
(2) sharpen your mathematical intuition through many attempts (successful and unsuccessful) to prove true statements, find counterexamples to false statements, and determine whether a given true-seeming statement is actually true

(3) improve your problem-solving skills by submitting solutions to weekly homework assignments.

Instructor DEI Statement

Mathematics culture, and STEM culture more generally, has many problematic aspects. Various kinds of systemic exclusion and abuse along racist, sexist, LGBTQ-phobic, ablest, classist, and other lines, are perpetuated both intentionally and unintentionally. Many of us in various STEM communities are working to change this, but we all have blind spots and bad habits, myself included. If there's anything I can do to more effectively welcome you into my classroom, or if I do something that inhibits your ability to fully participate, I want to know. You are welcome to share concerns with me at any time, and I will solicit anonymous feedback from the class at least once during the semester.

Accommodations for student needs

I will make every reasonable effort to accommodate your needs including, but not limited to, religious observances, disabilities, and health (physical and mental). If you require accommodations of any kind, including deadline extensions, please let me know as soon as you are aware. For disability accommodations, I may ask you to register with the Goldman Center for Student Accessibility (URL below).

Textbook

The textbook for this course is *Linear algebra done right* by Axler. This is an open-access textbook which is freely available online: `https://linear.axler.net/LADR4e.pdf`. Lectures will follow the textbook as closely as possible. I *highly* recommend that you read the relevant section in the textbook after each lecture.

Website

The course website will be the Tulane Canvas website. The website will contain grades, homework assignments, and other relevant information about the course. Important announcements about the course may be posted on the website.

Homework

Homework assignments are the most important part of this course. They will be due about once a week. They will be posted and collected on canvas. A random selection of problems will be graded from each assignment.

Grade

Your final numerical grade will be the average of your homework grades, after dropping your two lowest-scoring assignments. Conversion from numerical grades to letter grades will be as follows. At the end of the course these may be adjusted, but only in your favor.

- A= $(90\%, 100\%]$
- B= $(80\%, 90\%]$
- C= $(70\%, 80\%]$
- D= $(60\%, 70\%]$
- F= $[0\%, 60\%]$.

ADA/Accessibility Statement

Tulane University is committed to offering classes that are accessible. If you anticipate or encounter disability-related barriers in a course, please contact the Goldman Center for Student Accessibility to establish reasonable accommodations. If approved by Goldman, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely fashion. I will never ask for medical documentation from you to support potential accommodation needs. **Goldman Center contact information:** Email: goldman@tulane.edu; Phone (504) 862-8433; Website: accessibility.tulane.edu

Code of Academic Conduct

The Code of Academic Conduct applies to all undergraduate students, full-time and part-time, in Tulane University. Tulane University expects and requires behavior compatible with its high standards of scholarship. By accepting admission to the university, a student accepts its regulations (i.e., Code of Academic Conduct and Code of Student Conduct) and acknowledges the right of the university to take disciplinary action, including suspension or expulsion, for conduct judged unsatisfactory or disruptive.

Unless I indicate differently on instructions, all assignments and exams are to be completed individually and without any study aid, including textbooks, class notes, or online sites. If you have any question about whether a resource is acceptable, you must ask the instructor rather than assume.

Equity, Diversity, and Inclusion Statement (EDI)

Equity, diversity, and inclusion (EDI) are important Tulane values that are key drivers of academic excellence in our learning environments. In our drive for academic excellence, we seek to ensure that students, faculty, and staff across diverse social identities, cultural backgrounds, and lived experiences can thrive - especially those from underrepresented and underserved communities (e.g., race/ethnicity, gender identity and expression, sexual orientation, disability, social class, international, veterans, religious minorities, age, and any other classification protected by applicable law - see Tulane's Nondiscrimination Policy). In order to build a supportive culture and climate for every member of our community, we recognize that we each of have unique EDI strengths to share with others and that we also have areas for EDI growth, learning, and change. This EDI commitment and cultural humility helps us collectively build a university community and culture where everyone experiences belonging.

Religious accommodation policy

Per Tulane's religious accommodation policy as stated at the bottom Tulane's academic calendar, I will make every reasonable effort to ensure that students are able to observe religious holidays without jeopardizing their ability to fulfill their academic obligations. Excused absences do not relieve the student from the responsibility for any course work required during the period of absence. Students should notify me within the first two weeks of the semester about their intent to observe any holidays that fall on a class day or on the day of the final exam.

Title IX:

Tulane University recognizes the inherent dignity of all individuals and promotes respect for all people. As such, Tulane is committed to providing an environment free of all forms of discrimination including sexual and gender-based discrimination, harassment, and violence like sexual assault, intimate partner violence, and stalking. If you (or someone you know) has experienced or is experiencing these types of behaviors, know that you are not alone. Resources and support are available: you can learn more at allin.tulane.edu. Any and all of your communications on these matters will be treated as either "Confidential" or "Private" as explained in the chart below. Please know that if you choose to confide in me, I am required by the university to share your disclosure in a Care Connection to the Office of Case Management and Victim Support Services to be sure you are connected with all the support the university can offer. The Office of University Sexual Misconduct Response and Title IX Administration is also notified of these disclosures. You choose whether or not you