

MATH 2270-001: Linear Algebra

MTWF 10:45am-11:35am, Room: JTB 110

General Information

Instructor: Anna Romanova, Office: JWB 115 (President's Circle), Email: romanova@math.utah.edu,
Web Page: www.math.utah.edu/~romanova

Office Hours: Mondays 11:45am - 12:45am, Tuesdays 3-4pm

Textbook: Linear Algebra and its Applications, 5th edition, by David D. Lay. ISBN: 032198238X

Course Web Page: All course information and announcements will be posted on Canvas. You can access the course's Canvas page through CIS. This page contains material that may help you succeed in this course. Check it frequently!

Prerequisites: C or better in MATH 2210 or MATH 1260 or MATH 1280 or MATH 1321 or MATH 1320.

Course Overview: This course is the first course in a year long sequence (2270-2280) devoted to linear mathematics. In this course, we study two objects: vectors and matrices. We start by thinking of vectors and matrices as arrays of numbers, then we progress to thinking of vectors as elements of a vector space and matrices as linear transformations. In our study of vectors and matrices, we learn to solve systems of linear equations, familiarize ourselves with matrix algebra, and explore the theory of vector spaces. Some key concepts we study are determinants, eigenvalues and eigenvectors, orthogonality, symmetric matrices, and quadratic forms. Along the way we encounter applications of the material in science and engineering.

Teaching and Learning Methods

This class may be structured differently than your previous math courses. I have constructed this course around research-based practices to best help you learn and grow in your mathematical thinking. I would like to be transparent with you about my teaching methods in order to make this course as productive for you as possible.

Growth Mindset, Making Mistakes, and Failure: The best mathematicians fail big and fail often. I strive to challenge you to engage with difficult problems in this class. Sometimes you will solve them, and sometimes you will not. In-class assignments are based on effort, not correctness, to encourage problem solving and help you become comfortable with the struggle of growing mathematically. Additionally, I encourage you to focus on growth and improvement. **Mathematics is not an innate ability; it is a skill we learn and refine through hard work and persistence.** For this reason, I will replace a low midterm score with a higher final exam score when the final exam reflects an improved understanding of the material.

Learning Communities: Communication and collaboration is an important part of being a professional mathematician, computer scientist, physical scientist, or engineer. This class will be organized into learning communities so that you have a group of your peers with whom you can ask questions, get feedback, and build connections. The learning community structure is also intended to foster a welcoming and safe learning environment in the classroom.

Active Learning: Research shows that we retain only around 5% of what we hear in a lecture, compared to 70% of what we practice by doing and over 90% of what we teach others. In this class we will use a combination of learning strategies, including lecture, discussion, group problem sessions, and video lectures. The more actively engaged you are in your own learning process, the more information you are likely to retain. I encourage you to help others understand the material, whether it's through your video lectures or during in-class assignments. This process benefits everyone, but it's especially helpful when you're the one who is teaching.

Course Work and Evaluation

Grading: Homework, Friday Food for Thought, video lectures, midterm exams, and the final exam will contribute to your final course grade. The breakdown of how each element contributes is the following:

Weekly Homework	24%
Friday Food for Thought	10%
Video Lectures	5%
Midterm 1	12%
Midterm 2	12%
Midterm 3	12%
Final	25%

I reserve the right to change the grade scheme as I see fit. Any other grade schemes will only be beneficial to your grade as compared to the above standard. Your final numerical grade will be rounded to the nearest integer, and letter grades will be distributed according to the following scheme: A (100-93), A- (92-90), B+ (89-87), B (86-83), B- (82-80), C+ (79-77), C (76-73), C- (72-70), D+ (69-67), D (66-63), D- (62-60), E (59-0).

Weekly Homework: There will be one homework assignment each week. Homework problems will be posted on canvas, and homework assignments will be due in class on Wednesdays. Homework assignments must be stapled. Unstapled assignments will not receive credit. I understand that sometimes homework cannot be completed on time due to circumstances beyond your control. To account for this, each student will be allowed to turn in **three** late homework assignments throughout the course of the semester. These assignments cannot be turned in more than one week

late, and must be turned in on a Wednesday with the next homework assignment. You do not need to tell me the reason why your homework assignment is late.

Friday Food for Thought: On Fridays without exams, we will spend half of the class time working on a collection of thought provoking problems. These problems will lend themselves naturally to discussion, and students will work with their learning communities to discuss/debate/ponder these questions. Students will turn in their Friday Food for Thought responses the following Monday in class, and these will be graded for completion. Solutions to Friday Food for Thoughts will be posted on Canvas. Your lowest Friday Food for Thought score will be dropped. (In other words, you can miss one Friday Food for Thought without penalty.)

Video Lecture Assignments: There are two components to the video lecture assignments: video lectures and video summaries. Students will be responsible for creating 3 video lectures and posting them in their Learning Community group on Canvas. Each video will be a 5-10 minute lecture on an assigned topic. In weeks that students are not responsible for creating a video lecture, they must complete a summary/feedback about on another student's video. Video lectures and video summaries will be graded for completeness and effort. For more details on the video lecture assignments, including a schedule and video resources, please see Canvas.

Midterms: There will be three midterm exams. They will take place on every fourth Friday of the semester: **February 3, March 3, and April 7**. These exams will include all material that has been covered in class since the previous exam. I will hold a review session for each midterm exam on the Thursday before exam from 10:45-11:35am in JWB 335. If you have to miss an exam for a legitimate reason, you must let me know before the exam takes place, and we can arrange for you to take the exam earlier that week, or the following Monday. If you take the exam at a different time than the rest of the class, I will have to write new problems. Because of this, the exam will be slightly harder than the original exam. I will not drop any exam scores, but if your score on the final exam is higher than your score on one or more of the midterm exams, your final exam score will replace your lowest midterm exam score when I calculate your final course grade. This policy only applies to students who took all three midterm exams - a zero on a midterm exam will not be replaced by the final exam.

Final Exam: The final exam for this course takes place on **Thursday, April 27** from **10:30am-12:30pm** in our regular classroom **JTB 110**. Note that this is the first day of finals week. You must take the final exam at this scheduled time - there will be no makeup exams. *If you cannot take the final exam at this time, please drop the class.* There will be a final exam review on the reading day, Wednesday, April 26, from 10:30am-12:00pm in JWB 335.

Other Policies and Resources

Math Tutoring Center: Do not hesitate to come to my office during office hours or by appointment to discuss a homework problem or any aspect of the course. Additionally, the T. Benny Rushing Mathematics Tutoring Center offers free tutoring. Beginning the second week of classes, tutoring will be available from 8am to 8pm Monday through Thursday and 8am to 6pm on Friday. If you want to hire an outsider tutor (for a fee), you can find a list of such people through the math department.

Veteran's Center: If you are a student veteran, the University of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8-5pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources: <http://veteranscenter.utah.edu/>. Please also let me know if you need any additional support in this class.

LGBT Resource Center: If you are a member of the LGBTQIA* community, I want you to know that my classroom is a safe zone. Additionally, the University of Utah has an LGBT Resource Center on campus. They are located in Room 409 in the Olpin Union Building. Hours: M-F 8-5pm. You can visit their website to find more information about the support they can offer, a list of events through the center and links to additional resources: <http://lgbt.utah.edu/>. Please also let me know if there is any additional support you need in this class.

The Americans with Disabilities Act: The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability Services.

Addressing Sexual Misconduct: Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veteran's status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801- 581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585- 2677(COPS).

Calculators: I will not allow you to use calculators on the midterms or the final exam. Calculators may be appropriate on certain homework problems, but I encourage you not to become dependent on them. If you do not already have a calculator, you do not need to buy one for this course. All calculations that you might need to do can be completed using Wolfram Alpha, which is available online for free.

Other policies:

- Please be respectful during lectures. You are an adult, and I will expect you to act accordingly. Examples of disrespectful behavior include texting, surfing the web, and talking while I am talking. If you are behaving disrespectfully in class, I will ask you to leave.
- If you have questions about your grade on an exam or homework assignment, you must bring them to my attention within a week of when the assignment was returned to you.
- If you cheat on any assignment, I will give you a zero on that assignment. Depending on the severity of the cheating, I may decide to fail you from the class. In all cases of academic dishonesty, I will report the incident to the Dean of Students.

Important Dates:

Drop Deadline	January 20
First Midterm	February 3
Withdraw Deadline	March 3
Second Midterm	March 3
Spring Break	March 13-17
Third Midterm	April 7
Classes End	April 25
Reading Day	April 26
Course Final	April 27

Disclaimer: I reserve the right to change any information in this syllabus throughout the semester. If I make a change to the course policies, I will inform you in class, and post an updated version of the syllabus to canvas. I will hold you accountable for information that is stated in class or posted on canvas.

Study Tips

- **Computation vs. Theory:** This course is a combination of computational mathematics and theoretical mathematics. By theoretical mathematics, I mean abstract definitions and theorems, instead of calculations. The computational aspects of the course may feel more familiar and easier to grasp, but I urge you to focus on the theoretical aspects of the subject. Linear algebra is a tool that is heavily used in mathematics, engineering, and science, so it will likely be relevant to you later in your career. When this time comes, you will find that the computations of linear algebra can easily be done by computing systems such as Matlab or Mathematica. But to understand the significance of these computations, a person must understand the theory of linear algebra. Understanding abstract mathematics is something that comes with practice, and takes more time than repeating a calculation. When you encounter an abstract concept in lecture, I encourage you to pause and give yourself some time to think about it. Try to give examples of the concept, and think about what the concept is good for.
- **Lectures:** I will use lectures to explain the concepts in the textbook as simply as possible. However, 50 minutes is usually not enough time to absorb a new concept. I will post an up-to-date schedule on canvas of what we will be covering each class period so that you will know which section we will cover on a given day. I encourage you to skim the section in the textbook before I lecture. Spend some time thinking about new definitions that are introduced, and try to think of examples.
- **Textbook:** The textbook is a valuable resource. It is the first place you should turn for supplemental material to the lectures. Skim the section before the lecture to prepare yourself, and after the lecture read the section more carefully to try to synthesize the material from class with the material from the textbook.
- **Getting Help:** In linear algebra, like most mathematics courses, definitions build on each other quickly. If you fall behind, it will be difficult to catch up. Work hard from the beginning, and come to office hours immediately if you don't understand something. Waiting two weeks and trying to catch up before the next exam is not a good strategy for success.

- **Working Together:** Mathematics is a collaborative subject. Talking through a concept with a peer can often be the best way to truly understand it. I encourage you to meet your classmates and form study groups. I welcome you to work together on homework, but be sure that the solutions you turn in are your own (written by you, in your own words). Identical copies of homework will be considered cheating.