MTH309 (SEC 001, 002, 003): LINEAR ALGEBRA
SPRING 2020

Lectures: MW 9:10–10:00am, 1279 Anthony Hall

Instructor: Jun Kitagawa
Office: C326 Wells Hall
Office hours: MW: 11:20–12:50pm
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Website: `https://users.math.msu.edu/users/kitagawa/teaching.html`

Recitation sections: All recitation sections meet F 9:10–10:00am.

Sec 001	Brandon Bavier	A208 Wells Hall
Sec 002	Andres Galindo Olarte	A322 Wells Hall
Sec 003	Seonghyeon Jeong	A201 Wells Hall

Textbooks (required):

- *Linear Algebra with Applications* (9ed), by Steven J. Leon.

Course description: This course will cover the basics of linear algebra. There will be a significant proof-based component of this course, **it is assumed that students are familiar with methods and techniques of proofwriting**. The course will (tentatively) cover most of Sections 1.1-1.5, Chapters 3, 4, and 5, and Sections 6.1-6.3 of the textbook, and a treatment of determinants that will differ slightly from the approach in Chapter 2.

Expectations: Students are expected to attend all lectures and recitation sections, and complete all assignments, quizzes, labs, and exams to their full extent. Students should expect to spend between 9 and 12 hours per week outside of lectures and recitations on this course in order to be able to pass. Students should take notes during lectures as presentation of material may deviate at times from what is offered in the textbook (especially regarding determinants, Chapter 2). Students are **expressly prohibited** from distributing notes of lectures and any materials provided during this course, in any medium, whether for or not for profit, **including but not limited to posting of materials on any website**.

Grading: Your total grade will be weighted as follows:

- 10% Homework assignments (11 total, lowest dropped)
- 11% Labs (7 total, lowest dropped)
- 12% Quizzes (4 total, lowest dropped)
- 18% each Midterm exams (2 total)
- 28% Final exam
- 3% Exam review attendance (3 total, 9/18, 10/30, and 12/6)

The minimal final grading scale is below:

Grade	0.0	1.0	1.5	2.0	2.5	3.0	3.5	4.0
Total %	[0,50)	[50,60)	[60,65)	[65,73)	[73,80)	[80,85)	[85,90)	[90,100]

Any curve (or lack thereof) for midterms or the final exam will be sent to all students in a reasonable amount of time after said exam, **please do not email to ask about the curve before this information is sent**.

Lecture / Lab format: Sections 001, 002, and 003 meet together for lecture on MW and each section meets separately for Friday section. Friday sections will consist of either a 50 minute Lab activity, a 25 minute review + a 25 minute Quiz, a 50 minute Midterm exam, or a review session (see schedule below for details). Homework assignments will also be collected and returned in Friday sections. You must attend the Friday section you are registered for. **Homework:** There will be 11 problem sets total and each will be due in

Friday sections (see schedule below). Each homework set will be of equal weight, and the lowest homework grade will be dropped at the end of the semester. A selection of problems will be graded, and points will also be given for completeness. **No late homeworks will be accepted**, **assignments will not be accepted electronically**. Homework problem lists will be emailed and also posted on the course website. Solutions will be provided for selected problems but not all of them, you are welcome to ask your TAs or lecturer in office hours about problems whose solutions are not provided in the key. This course has a lot of homework, it is recommended that you start on a section as soon as it is covered in lecture / recitation.

Lab activities: There will be 7 Lab activities during certain Friday sections. The lowest grade will be dropped at the end of the semester. Before each lab, a pre-lab handout will be sent to students via email, students should look through this before attending the Friday section. Students will be placed in groups of about 4 to complete the labs. **Labs will cover new material that is not in lectures**.

Quizzes: There will be 4 Quizzes during certain Friday sections. Quizzes will be 25 minutes long, the lowest quiz grade will be dropped at the end of the semester.

Midterm exams: There will be two midterm exams which will be held during Friday sections. The two exams will be: **January 31 and March 20**.

Final exam: The final exam will be held **Tuesday, April 28, 12:45pm-2:45pm** in **1279 Anthony Hall**. The exam will be comprehensive and will test all the material covered throughout the semester.

Exam review attendance: 1/29, 3/18 (lectures), and 4/24 (Friday section) will be exam review sessions. Attendance will be taken at the end of each session, and you will be awarded 1% for each session at the end of the semester if you are present. This 3% is part of the regular grade, not extra credit.

Absences: Students are solely responsible for all material covered during lecture / recitation. This means lecture notes, labs, lesson notes, etc. will not be provided if a student misses any session. Any changes to the syllabus or schedule, etc. will be announced during lecture. **Late homeworks will not receive any credit**. Students who fail to attend the first four class sessions or class by the fifth day of the semester, whichever occurs first, may be dropped from the course.

There will be no excused absences for midterm exams except for the following situations: short-term illness, accidents, university sanctioned events, military obligation, and grief absences (the university policy on grief absences here must be followed in such a case: `https://reg.msu.edu/AcademicPrograms/Text.aspx?Section=112#s13216`). Since midterms occur during the scheduled Friday session, **conflicts with other courses are not excused absences**. In all excusable cases, students must contact the instructor before the relevant Midterm exam; in case of emergency illness or accident, the student should contact the instructor within 48 hours of the missed Midterm exam. All excused absences will require documentation. If an excused absence is granted, the remaining Midterm exam will become worth 27% and the Final exam will be worth 37% of the final grade. If both Midterm exams are missed, one makeup midterm will be given.

For Quizzes and Labs, the lowest grade of each will be dropped at the end of the semester, as such **no makeups** will be allowed with the exception of university sanctioned events (this includes quizzes and labs missed due to religious observances). There will be no make-ups for the exam review credit.

Make-up Final Exam: The MSU final exam policy is available here: `https://reg.msu.edu/roinfo/calendar/FinalExam.aspx`. The final exam for this course is a "regularly scheduled course examination," if you have a "common final examination" (`https://reg.msu.edu/roinfo/calendar/CommonFinals.aspx`) that conflicts with MTH309, you must contact the instructor of the common final exam to arrange for a makeup time. Any student having three final exams scheduled the day of the Final exam may be able to move one of their exams. If this is the case, you must contact the Academic Student Affairs Office in your college as early in the semester as possible for assistance; if one of the exams is a common final exam the student is asked to take the makeup exam for that final exam course before rescheduling the MTH309 final.

Academic integrity: You are permitted to collaborate on homework problems, but you must write and submit your own answers, and indicate who you have collaborated with on each assignment. The Spartan Life booklet, General Student Regulations states "no student shall claim or submit the work of another as one's own."

Academic dishonesty is viewed as a very serious offense and comes with serious consequences, please familiarize yourself with university rules regarding academic conduct: `https://ombud.msu.edu/academic-integrity/`.

Relationship Violence and Sexual Misconduct policy MSU is committed to fostering a safe, productive learning environment. Title IX and MSU policy prohibits discrimination on the basis of sex and sexual misconduct — including harassment, domestic and dating violence, sexual assault, and stalking.

All instructors at MSU, including of this course, are **mandatory reporters** required to report any incidents of sexual misconduct to the Title IX coordinator with relevant details such as names of those involved, and thus cannot guarantee confidentiality.

MSU encourages anyone experiencing sexual misconduct to talk to someone about what happened, so they can receive necessary support and the university can respond appropriately. If you wish to speak confidentially about an incident of sexual misconduct, want more information about filing a report, or have questions about school policies and procedures, please contact MSU's Title IX Coordinator, which can be found on the school's website. MSU is legally obligated to investigate reports of sexual misconduct, and therefore it cannot guarantee the confidentiality of a report, but it will consider a request for confidentiality and respect it to the extent possible.

Important dates, Spring 2020:
Monday, 1/6: Classes begin.
Friday, 1/10: Online open add period ends (8pm).
Friday, 1/17: Last day to late add a course, change sections within a course, or drop to a lower level course. (Students go to C212 Wells Hall for Mathematics enrollment changes: drop to lower course, section changes)
Monday, 1/20: University Holiday, no class.
Friday, 1/31: End of 100% tuition refund (8pm).
Wednesday, 2/26: Last day to drop without a grade being reported (8 pm).
Monday, 3/2 to Friday, 3/6: Spring break, no classes.
Friday, 4/24: Last day of class.

Semester Schedule (tentative)							
Week 1	6-Jan	Lecture: 1.1+1.2 Intro: systems of eqn, augmented matrices	8-Jan	Lecture: 1.2 Gaussian elimination	10-Jan	Lab 1: More Gaussian elimination
Week 2	13-Jan	Lecture: 1.3+1.5 Matrix multiplication, elementary matrices	15-Jan	Lecture: 1.4 Matrix algebra	17-Jan	Lab 2: Elementary matrices and finding inverses (1.5) HW1 due
Week 3	20-Jan	No Lecture	22-Jan	Lecture: 1.4 cont.+3.1 Vector space axioms	24-Jan	Quiz 1: 1.1-1.5 HW2 due
Week 4	27-Jan	Lecture: 3.1 cont.+3.2 Vector spaces (examples and properties), subspaces	29-Jan	Midterm 1 review (1% credit)	31-Jan	Midterm 1 (1.1-1.5, 3.1, 3.2)
Week 5	3-Feb	Lecture: 3.2+3.4 Spanning sets and bases	5-Feb	Lecture: 3.4 cont.+3.3 Bases, dimension, and linear independence	7-Feb	Lab 3: Coordinates and change of bases (3.5) HW3 due
Week 6	10-Feb	Lecture: 3.4 Bases, dimension, and linear independence cont.	12-Feb	Lecture: 3.6 Rank nullity	14-Feb	Quiz 2: 3.1-3.6 (except rank-nullity) HW4 due
Week 7	17-Feb	Lecture: 4.1 Linear transformations	19-Feb	Lecture: 4.1+4.2 Matrix representations of linear transformations	21-Feb	Lab 4: Linear transformations and coordinate changes (4.3) HW5 due
Week 8	24-Feb	Lecture: Determinant: motivation and properties	26-Feb	Lecture: Determinant: row operations and calculating	28-Feb	Lab 5: Cofactor expansion of determinants HW6 due
Week 9	9-Mar	Lecture: Existence of the determinant	11-Mar	Lecture: 5.1 Inner product on R^n	13-Mar	Quiz 3: 3.6 (rank-nullity), 4.1-4.3, determinants HW7 due
Week 10	16-Mar	Lecture: 5.1 cont.+5.2 R^n cont. + orthogonal subspaces	18-Mar	Midterm 2 review (1% credit)	20-Mar	Midterm 2 (3.3-3.6, 4.1-4.3, determinants, 5.1)
Week 11	23-Mar	Lecture: 5.2 Orthogonal subspaces cont.+matrix subspaces	25-Mar	Lecture: 5.4 Inner product spaces	27-Mar	Lab 6: properties of inner product spaces HW8 due
Week 12	30-Mar	Lecture: 5.3 Least squares	1-Apr	Lecture: 5.5 Orthogonal bases	3-Apr	Lab 7: Solving least squares HW9 due
Week 13	6-Apr	Lecture: 5.6 Gram-Schmidt	8-Apr	Lecture: 6.1 Eigenvalues and eigenvectors	10-Apr	Quiz 4: 5.1-5.6, 6.1 HW10 due
Week 14	13-Apr	Lecture: 6.3 Diagonalization	15-Apr	Lecture: 6.2 Application: systems of differential equations	17-Apr	Review
Week 15	20-Apr	Lecture: 6.3 Diagonalization cont.	22-Apr	Final Review	24-Apr	Final Review (1% credit) HW11 due