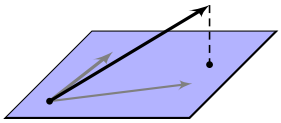

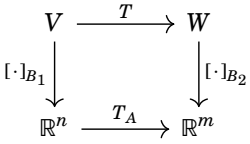

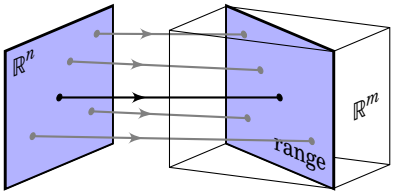

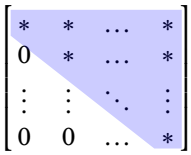

MATH 232: Linear Algebra

Fall 2021 **Oberlin College**

Lecture Information:

Section 1: MWF, 11:00–11:50 AM, in King 106

Section 2: MWF, 1:30–2:20 PM, in Science Center A255

Instructor:
Nathan Gray
Office: Rice 103
Office Hours: TBA
Email: ngray@oberlin.edu

Prerequisites: MATH 220 or 231.

Textbook (required): Jeffrey Holt, *Linear Algebra with Applications,* 2nd ed., W.H. Freeman, New York, 2017. We will cover much of Chapters 1–9.

Course Description: This is an introduction to the ideas and methods of linear algebra. Linear algebra is one of the pillars of modern mathematical thought. It is one of the most fundamental and important areas in all of mathematics, having an enormous number of uses in mathematical and scientific applications. It is no exaggeration to claim that every area of mathematics relies, in some way, on concepts and techniques from linear algebra.

Many real-world applications involve systems of linear equations, whose sizes can be quite large. For example, in mathematical biology or image processing, there can be millions of linear equations, each involving millions of variables. (Another example is the Google PageRank algorithm.) Linear algebra gives a systematic, mathematical method for solving these large linear systems.

But linear algebra is more than simply solving systems of linear equations. One aim of the course is to understand the abstract nature of solving a system of linear equations. Doing so will allow us to see the related structures that appear in various mathematical and scientific disciplines, even when those structures are not in the form of a system of linear equations. One of the main structures we will study is that of a vector space, the most familiar vector space being $\mathbb{R}^n$. An important idea in the course is that every n-dimensional vector space (such as $\mathbb{R}^n$) is "just like" $\mathbb{R}^n$ itself.

Main Topics: Systems of linear equations; Gaussian elimination; matrices and operations; the vector space $\mathbb{R}^n$ and its subspaces; bases for $\mathbb{R}^n$; determinants; vector spaces and their subspaces; bases and dimension; linear transformations; eigenvalues and eigenvectors; diagonalization.

Homework, Exams:

Homework: There will be (almost) weekly homework assignments. The two lowest homework grades will be dropped at the end of the semester. Assignments must be submitted through Gradescope (see page 2).

Students are expected to complete the assignments on their own. However, collaboration with classmates *before the write-up* is acceptable and encouraged, as long as each student writes and submits their own work. Collaboration during the write-up stage of an assignment, or handing in an assignment that is practically identical to a fellow classmate's work, is cheating and may result in a grade of zero for the assignment. Late homework is not accepted.

Exams: There will be two midterm exams (part in-class, part take-home) and a cumulative final exam. Rules regarding the take-home portions will be announced in lecture.

Grading Policy: Course grades will be based on homework and exams. Every student's grades are a reflection of the student's mastery of the course material and the student's ability to communicate that mastery through written work.

Category	Grade Basis	Weight (each)	Weight (total)
Homework	lowest 2 dropped		22%
Exams (×2)		22%	44%
Final Exam		34%	34%
Total			100%

Earning 90%, 80%, and 70% of the total points in the course will result in course letter grades *no stricter than* A−, B−, and C−, respectively. The boundaries (cut-offs) between letter grades may be relaxed at the instructor's discretion, depending on the distribution of course numeric grades. This grading scheme rewards hard work, leaving little room for miraculous recovery.

Course Load: Oberlin College complies with federal regulations defining a credit hour. In this course, all students are expected to have 12 hours per week of academically engaged time throughout the semester. This amounts to 8–9 hours per week of additional academic work outside of lectures.

Technology:

Google Drive Folder: All course materials will be posted there.

Gradescope: This course will use the website Gradescope in order to provide fast and accurate feedback on students' work.* Homework will be submitted and graded through Gradescope. Once the grades are posted, students will be notified immediately so that they can log in and see their feedback. Each student may also submit regrade requests if they feel that the grader has made a mistake.

After the instructor registers students into Gradescope, students should log in using their Oberlin email addresses. The initial password for each student can be changed at `gradescope.com/reset_password`. The same link can be used if students need to set their passwords for the first time.

Calculators: All electronic devices, except for *non-programmable scientific calculators,* are banned from use during exams.

Schedule: A tentative schedule can be found in the course's Google Drive folder. It will be updated frequently.

Attendance, Make-Up Policy: Students should understand the importance of attending lectures and doing the assigned work.

A student who misses a lecture is responsible for any announcements made during that time. Moreover, ***late homework is not accepted.*** A legitimate absence due to a recognized Oberlin-related activity, a religious holiday, a verifiable illness, or an emergency will be reviewed on an individual basis. If a student must miss an exam, they must obtain permission from the instructor in advance.

With that said, students who are sick should notify the instructor and stay home.

Disability Accommodations: Oberlin College is committed to providing equitable access to learning opportunities for all students. If you have a disability and are seeking accommodations, please contact the Disability Resources at the Center for Student Success. All requests for accommodations must go through that office. You should also contact the instructor *at least* two weeks before the accommodations are needed.

Liberal Education: An important part of any liberal education is learning to use abstract thinking and symbolic (mathematical) language to solve practical problems. In this course, students will be exposed to theoretical concepts at the heart of linear algebra. Most of the course will be spend on theory rather than on applications. This is out of necessity, since having a solid theoretical foundation helps when engaging with applications.

*`www.gradescope.com`

Scholastic Dishonesty: This includes: cheating on exams; taking or using past/present exam materials without instructor permission; submitting false or incomplete records of academic achievement; acting alone or in cooperation with another to falsify records or to obtain grades dishonestly. *All students are expected to follow the Honor Code.* If it is determined that a student has cheated, they may be given a grade of F for the course and may face additional sanctions from Oberlin College.

Course Help: Studying mathematics can be difficult. Here is some advice:

Reading: The relevant material should be read *before* lecture. If there are reading questions assigned for that material, then do your best to complete them.

Homework: Begin it *immediately after* lecture, doing as much as you can *on your own* for the first few days that it is assigned. During this period, you should not be discussing solutions with others. Once you have completed all that you can, spend the last few days discussing the problems with one or more classmates to get further help. ***Do not search for homework solutions online.*** This creates a destructive habit; it also violates the Oberlin Honor Code.

Free Tutoring: Here are some options.

- *Course HOOT:* Meet with Ishaq Kothari, the HOOT (dedicated tutor) for the course. His schedule will be made available at the beginning of the semester.
- *Academic Advising Resource Center:* Their Peer Tutoring program connects peer tutors to enrolled students who would like some study support or a learning partner. Every tutor has been recommended by a faculty member. For more information, visit `www.oberlin.edu/aarc/peer-tutoring` or contact `peertutoring@oberlin.edu`.