

MA 211
Introduction to Matrix Theory and Linear Algebra
Fall 2007

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Office Hours: 3:00p.m-4:00p.m. MWThF, and by appointment.

Note: I am available to help students whenever I am in my office; please feel free to drop by.

Course Information:

Class meets MWF at 12:00-12:50p.m. in WS 3602 for lecture and discussion.

Textbook:

Linear Algebra with Applications, 7th edition, by Seven J. Leon.

The following chapters and some additional material will be covered.

Chapter 1- Matrices and systems of equations

Chapter 2- Determinants

Chapter 3- Vector spaces

Chapter 4- Linear transformations

Chapter 5- Orthogonality

Chapter 6- Eigenvalues

Software:

Maple can be loaded to your ThinkPad for free at the Help Desk in LRC.

Course Description:

The basic problem in linear algebra is to solve a system of linear equations. The word “system” indicates that there are multiple equations and multiple unknowns; the word “linear” means that the equations are of a particular, simple type. Fundamentally related to systems of linear equations is the concept of a linear transformation, which takes an input vector (an aggregation of variables), and transforms it to an output vector, again in a particular, simple fashion.

Systems of linear equations and linear transformations are of interest in their own right. Sometimes the problem at hand, when modelled mathematically, is nothing more than a system of linear equations, and some physical systems transform inputs into outputs in a linear way. However, the importance of linear algebra goes beyond this. Most nonlinear problems can be solved only through the process of linear approximation. Therefore, practically every nontrivial problem in mathematics, science, and engineering involves linear algebra, and, for this reason, linear algebra may well be the most important branch of mathematics.

In MA211, we study the following three problems:

- Solve a square linear system (that is, a system with the same number of equations as variables).
- “Solve” a non-square linear system (that is, one with too many equations or too many variables). The word “solve” is in quotation marks because such a system generally does not have a solution, or has infinitely many solutions, so it is not immediately obvious what is meant by solving such a system.
- Find the eigenvectors of a linear transformation—the special inputs that are transformed in an especially simple fashion.

We also learn the associated vocabulary and concepts that allow us to understand what these computations mean, and some of the prominent applications that make these computations important.

Attendance:

Attendance and participation are crucial to your success in this course. I will be counting on you to be in class and to be prepared. If you are unable to attend a class due to an illness or personal loss, you should contact me as soon as possible. Students are limited to five unexcused absences. For more than five unexcused absences, I reserve the right of deducting points from your total participation points.

Grading Policy:

The final grade will be based on the homework, worksheet, quizzes, three midterm exams and one final exam weighted as follows:

| | |
|--|----------------------|
| Class Participation, Homework, Worksheet and Quizzes | 175 points |
| Midterm Exams (3) | 525 (3 × 175) points |
| Final Exam | 300 points |
| Total | 1000 points |

Your scores on all assignments will be combined (according to the above weights) into a single percentage P. Your letter grade will then be determined as follows:

| | |
|-------------|----|
| $\geq 93\%$ | A |
| 92 – 88% | A- |
| 87 – 84% | B+ |
| 83 – 80% | B |
| 79 – 77% | B- |
| 76 – 74% | C+ |
| 73 – 70% | C |
| 65 – 69% | D+ |
| 60 – 64% | D |
| $< 60\%$ | F |

Homework, Worksheet and Quizzes:

Homework assignments and worksheet will be given, some of which will be collected and graded. Homework and worksheet are one of the most crucial parts of the class. It is expected that you will complete them to the best of your ability.

A number of in-class quizzes will be given during the semester. The content of the quizzes will be closely related to the assigned homework problems. It is to your advantage, then, to carefully complete each homework problem and ask questions about those you do not fully understand.

Exams:

Three semester exams and a comprehensive final exam will be given. All exams may include calculator and non-calculator sections.

Help: Help is available from many different sources, including:

1. I am available to help you during posted office hours and whenever I am in my office.
2. Math Lab.

Disability Services:

If you have a need for disability-related accommodations or services, please inform the Coordinator of Disability Services in the Disability Services Office by: coming into the office at 2001 C. B. Hedgcock; calling 227-1700; or e-mailing disserv@nmu.edu. Reasonable and effective accommodations and services will be provided to students if requests are made in a timely manner, with appropriate documentation, in accordance with federal, state, and University guidelines.

Succeeding in Linear Algebra and other college courses

The following excerpt is from the article Teaching at the University Level by Steven Zucker (Johns Hopkins University), which appeared in the Notices of the American Mathematical Society, August 1996. What follows is what an entering freshman should hear about the academic side of university life.

1. You are no longer in high school. The great majority of you, not having done so already, will have to discard high school notions of teaching and learning and replace them by university-level notions. This may be difficult, but it must happen sooner or later, so sooner is better. Our goal is more than just getting you to reproduce what was told to you in the classroom.
2. Expect to have material covered at two to three times the pace of high school. Above that, we aim for greater command of the material, especially the ability to apply what you have learned to new situations (when relevant).
3. Lecture time is at a premium, so it must be used efficiently. You cannot be "taught" everything in the classroom. It is your responsibility to learn the material. Most of this learning must take place outside the classroom. You should be willing to put in two hours outside of the classroom for each hour of class.
4. The instructor's job is primarily to provide a framework, with some of the particulars, to guide you in doing your learning of the concepts and methods that comprise the course. It is not to "program" you with isolated facts and problem types nor to monitor your progress.
5. You are expected to read the textbook for comprehension. It gives the detailed account of the material of the course. It also contains many examples of problems worked out, and these should be used to supplement those you see in the lecture. The textbook is not a novel, so the reading must often be slow-going and careful. However, there is the clear advantage that you can read it at your own pace. Use pencil and paper to work through the material and to fill in omitted steps.