

## MATH 254: Introduction to Linear Algebra

Fall 2013 MWF 1-1:50pm, PS-130

### Overview:

Linear algebra is concerned with functions, equations, and transformations that are *linear*. This is a very special, simple case. By insisting on this restriction, very powerful tools can be developed that would not be available without it. These tools are of tremendous value in a variety of contexts in the physical and social sciences. The linear restriction is actually not that extreme, because nonlinear functions can sometimes be approximated by linear functions using calculus.

### Learning Objectives:

Students will carefully state all definitions and theorems relevant to the course, including all conditions and exceptions (if any). A partial list of these definitions is available in Chapter 0.

Students will apply these definitions to objects and determine whether or not the definition applies. This will typically involve a calculation.

Students will have a ready supply of examples and non-examples to these definitions, and will be able to justify why these are examples or non-examples.

Students will learn how to determine the number of solutions (if any) to a system of linear equations. They will be able to find all solutions.

Students will master computational matrix algebra. This will include matrix addition, scalar multiplication, matrix multiplication, elementary row/column operations, diagonalization, transposition, finding inverses, finding determinants, change of basis, orthogonalization, finding eigenvalues/eigenvectors, and normal forms.

Students will visualize vector spaces geometrically. This will include dimension, inner products, orthogonality, norms, projections, rank, and nullity.

### Textbook:

*Beginning Linear Algebra*, by Seymour Lipschutz, ISBN 0-07-038037-6

Students are expected to read the text; it is quite brief and easy to understand. It contains two types of exercises: solved problems, and supplementary problems. Students are expected to read (and work, if possible) all the solved problems carefully, and to work all the supplementary problems (brief answers follow). Homework will not be collected, and will generally not be discussed in class due to time constraints – please bring homework questions to office hours, or ask via email.

### Chapter 0:

This supplement contains the most important definitions and ideas of the course. Students are strongly encouraged to know them thoroughly. The ideas will be expanded upon, and examples added, as the course continues.

*Every exam will contain some material explicitly from Chapter 0.*

**Course Mechanics:**

We will cover one chapter each week, and take a brief (30 min.) chapter test on Wednesdays. The sole exception is Chapter 2, which will be split into two weeks. The first half is sections 2.1-2.4; the associated problems are 2.1-2.21, 2.70-2.78. The second half is sections 2.5-2.10; the associated problems are 2.22-2.69, 2.79-2.92. Test schedule:

Sep. 4	Chapter 0	Oct. 9	Chapter 4	Nov. 13	Chapter 9
Sep. 11	Chapter 1	Oct. 16	Chapter 5	Nov. 20	Chapter 10
Sep. 18	Chapter 2a	Oct. 23	Chapter 6	Nov. 25-29	Holiday
Sep. 25	Chapter 2b	Oct. 30	Chapter 7	Dec. 4	Chapter 11
Oct. 2	Chapter 3	Nov. 6	Chapter 8	Dec. 11	Chapter 12
FINAL EXAM: Friday, Dec. 13 1pm-3pm (in PS-130)					

**Attendance:**

Students are expected to attend every class. Makeup exams are not given under any circumstances; each student's lowest exam grade is dropped, to account for unexpected eventualities. Under extraordinary circumstances (e.g. hospitalization), a second exam grade might be dropped.

**Collaboration:**

Students are strongly encouraged to study together, and to work together to solve exercises. Exams must be taken without assistance, however.

**Grading:**

The 13 exams (after dropping one) will be worth 5% of the course grade each. Class participation will be worth 10% of the course grade, to be based on attendance (which will be checked, using magic, at random). The final exam will be worth 25% of the course grade. All grades will be normalized to lie between 50% (blank but present) and 100% (perfect score). Missing grades will still be 0%. The grading policy is as follows:

A	A-	B+	B	B-	C+	C	C-	D+	D	F
92.0	90.0	88.0	82.0	80.0	78.0	72.0	70.0	68.0	62.0	0

**Extra Credit:**

Students are permitted to submit, at the start of class Friday, a corrected version of Wednesday's exam. Their revised grade will be the average of the two grades. Students are permitted to do this at most three times during the semester, and never two exams in a row. No other forms of extra credit will be possible.

**Professor:**

Vadim Ponomarenko

<http://www-rohan.sdsu.edu/~vadim/> (all old exams may be found here)

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Office hours: GMCS 511, Wednesdays 9:45-12:45, and by appt.

**Teaching Assistant:**

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Office hours: GMCS 528, Mondays 11-12, Wednesdays 9-10, Fridays 11-12, and by appt.