Math 200 - Linear Algebra
Spring Term 2017
Course Description

April 7, 2017

Instructor: John Schmitt
Office: Warner 311, **Tel:** Ext. 5952
E-mail: jschmitt@middlebury.edu
Office Hours: Monday 10-11:30am, Wednesday 10-11:30am, Thursday 1:30-3pm and by arrangement

Meeting Times:
Section A – MWF, 8:00-8:50am Warner 208
Section B – MWF, 9:05-9:55am Warner 203

Textbook: David Lay's *Linear Algebra and its Applications, 4th edition*, Pearson Education, Inc., Boston, 2012. **Not the 5th edition!** (Note that there is little change in content between the various editions. I'd like for us to use the 4th edition in order to save you money!)

Homework: Homework will be assigned on a daily basis. The content of this course is best learned by *practicing problems.* I **encourage you to work together**. However, the write-up of homework solutions *should be done on your own.* Homework will be collected three times a week, on Monday, Wednesday and Friday. Please see my *Thoughts on Homework.*

Quizzes: I reserve the right to give quizzes. If given, they will be short in length and cover recent homework problems. They will generally be announced beforehand.

Additional Resources

- I hope to have several copies of course text available at the circulation desk in the Davis Family Library for short-term checkout.
- Text available in library: Howard Anton, Chris Rorres, *Elementary linear algebra: applications version, 8th edition,* Wiley, New York, 2000.

- Text available in library: Peter D. Lax, *Linear algebra*, Wiley, New York, 1997.
- Text available in library: Serge Lang, *Linear Algebra, 3rd edition*, Springer-Verlag, New York, 1987.
- Textbook website: http://www.laylinalgebra.com
- Course website available at: http://community.middlebury.edu/∼jschmitt/
- Professor Swenton's interactive linear algebra website: http//community.middlebury.edu/∼mathanimations/
- The software package Maple 2016 is available on many computers throughout campus and should facilitate computations and drawing when appropriate. Other software packages may also be useful, including Mathematica and MATLAB.

Special Needs: If you require special arrangements for class or during tests/exams please talk to me as soon as possible to make such arrangements.

Grading Percentages:

Homework/Quizzes	10
Midterms	60 (30 each)
Final	30

The lowest two homework scores will be dropped from consideration.

Assignment of Grades:

The assignment of grades will follow the scheme below at minimum.

90 and above	A
80 - 89	B
70 - 79	C
60 -69	D
below 60	F

Plus and minus will be assigned at my discretion.

Midterm Exams: Midterm on Chapters 1 and 2: Thursday, March 16 at 7:30pm
Midterm on Chapters 3 and 4: Thursday, April 20 at 7:30pm. Midterms may include a "pledged problem" due on or around the exam date.

Final Exam: Thursday, May18, 2-5pm in WNS 208 and WNS 207.

Absences: Please see me as far in advance as possible for absences that will occur on the day of an exam. Any such absences, or unforeseen ones, must be documented in writing by the appropriate person.

Honor Code: The Honor Code will be observed throughout this class and for all examinations. The most common ways the Honor Code has been violated in this class are: copying solutions for homework problems from another student or from an internet source, and copying/sharing answers on a mid-term or final exam. When these have been identified, the matter has been referred to the College's Judicial Affairs Officer. If you have a question about how the Honor Code applies to this class please ask.

Course Webpage: Problem sets and syllabi and other relevant material will be posted on a course website, available by linking from my homepage:
http://community.middlebury.edu/∼jschmitt/.

Basic Etiquette: Please turn off all cell phones and other noise-making electronic devices. I anticipate you remaining seated in the room for the entire time period, though not without exception.

Goals of the course:

- gain an understanding of basic linear algebra techniques,
- gain the skills to perform computations involving vectors, matrices and systems of linear equations,
- gain an appreciation for applications of linear algebra to biology, economics, engineering, physics, computer science and more,
- gain a desire for further study within mathematics,
- improve one's ability to write a logical and coherent mathematical proof.

Linear Algebra - Course Content

1. Linear Equations in Linear Algebra
    - Systems of linear equations
    - Row reduction and echelon forms
    - Vectors and vector equations
    - The matrix equation $A\mathbf{x} = \mathbf{b}$
    - Linear independence
2. Matrix algebra
    - Matrix operations
    - Characterizations of invertible matrices
3. Determinants
    - Basic introduction and properties
4. Vector spaces
    - Vector spaces and subspaces
    - Null spaces, column spaces and linear transformations
    - Bases, dimension, rank, change of basis
5. Eigenvalues and eigenvectors
    - Eigenvalues and eigenvectors
    - The characteristic equation
    - Diagonalization
    - Eigenvectors and linear transformations
6. Orthogonality and Least Squares
    - Inner product, length and orthogonality
    - Orthogonal sets and projections
    - The Gram-Schmidt process

Table 1: Below is a "fairly" accurate schedule for the topics we will cover, and exam dates. These may change, if need be.

Week beg. Mon.	Monday	Tuesday	Wednesday	Thursday	Friday
February 13	1.1 Systems of Linear Equations		1.2 Row reduction and echelon forms		Winter Carnival
February 20	1.3 Vector equations		1.4 The matrix equation $A\mathbf{x} = \mathbf{b}$		1.5 Solutions sets of linear systems
February 27	1.6 Network flow		1.7 Linear independence		1.8 Linear transformations
March 6	1.9 Matrix of linear transformation		2.1 Matrix operations (and adjacency matrices)		2.2 Inverse of a matrix
March 13	2.3 Characterizations of invertible matrices			EXAM through 2.3	2.4 Partitioned matrices
March 20	2.5 Matrix factorizations		3.1 Into. to determinants		3.2 Properties of determinants
March 27	Spring	Recess	No	Class	
April 3	4.1 Vector spaces and subspaces		4.2 Null spaces, column spaces, linear transformations		4.3 Linearly independent sets; bases
April 10	4.4 Coordinate systems		4.5 Dimension of a vector space		4.6 Rank
April 17	4.7 Change of basis		4.9 Markov Chains	EXAM	Spring Symposium
April 24	5.1 Eigenvectors and eigenvalues		5.2 The characteristic equation		5.3 Diagonalization
May 1	5.4 Eigenvectors and linear transformations		6.1 Inner product, length, orthogonality		6.2 Orthogonal sets
May 8	6.3 Orthogonal projections		6.4 Gram-Schmidt process		6.5 Least Squares
May 15	Google's Page Rank				