

Math 200 A and B: Linear Algebra  
Spring Term 2007  
Course Description

February 25, 2007

**Instructor:** John Schmitt

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Office Hours: Monday, Wednesday 11am-12pm, Wednesday 1:30-3:00 pm, Friday 2-3 pm,  
or by arrangement

**Meeting Times:**

**Section A**

MWF, 9:05 am - 9:55 am Warner 207

**Section B**

MWF 10:10 am - 11:00 am Warner 207

**Textbook:** David Lay's *Linear Algebra and its Applications, 3rd edition*, Pearson Addison Wesley, Boston, 2006.

**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.

**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**

- Text available in The Un-named Library: Howard Anton, Chris Rorres, *Elementary linear algebra: applications version, 8th edition*, Wiley, New York , 2000.
- Text available in The Un-named Library: Peter D. Lax, *Linear algebra*, Wiley, New York, 1997.

- Text available in The Un-named Library: Serge Lang, *Linear Algebra, 3rd edition*, Springer-Verlag, New York, 1987.
- Textbook website: <http://www.laylinalgebra.com/>
- My website (where course materials may be available): <http://community.middlebury.edu/~jschmitt/>
- Professor Swenton's interactive linear algebra website: <http://community.middlebury.edu/~mathanimations/>
- Software package, Maple, available on many computers throughout campus. Version 10 should now be available and facilitate computations when appropriate. Free student versions may also be available for download to your own machine. 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
Final	30

The lowest two homework scores will be dropped from consideration.

**Assignment of Grades:**

The assignment of grades will follow the scheme below.

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:** Thursday evening, 7:30 pm, March 15

Thursday evening, 7:30pm, April 19

**Final Exam:** Wednesday, May 16, 9am-12pm, Warner 203, 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. If you have a question about how the Honor Code applies to this class please ask.

**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 others
- gain a desire for further study within mathematics so that one may see how ideas are played out in such subject areas as combinatorics, graph theory, abstract algebra, analysis, statistics, coding theory, cryptography ...
- 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  $A\mathbf{x} = \mathbf{b}$
  - Solving linear systems
  - Linear Independence
2. Matrix Algebra
  - Matrix Operations
  - Characterizations of Invertible Matrices
3. Determinants
  - A 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
  - Eigenvectors and eigenvalues
  - 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
7. Symmetric Matrices (if time permits)
  - Diagonalization
  - Singular Value Decomposition

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

	Monday	Tuesday	Wednesday	Thursday	Friday
February 12	1.1 Systems of Linear Equations		1.2 Row Reduction and Echelon Forms		1.3 Vector Equations
February 19	1.4 The Matrix Equations $A\mathbf{x} = \mathbf{b}$		1.5 Solution Sets of Linear Systems (and Network Flow)		Winter Carnival
February 26	1.7 Linear Independence		1.8 Intro. to Linear Transformations		1.9 Matrix of a Linear Transformation
March 5	2.1 Matrix Operations (and Dominance and Adjacency Matrices)		2.2 Inverse of a Matrix		2.3 Characterizations of Invertible Matrices
March 12	2.4 Partitioned Matrices		Questions	EXAM through 2.3	2.5 Matrix Factorizations
March 19	3.1 Intro. to Determinants		3.2 Properties of Determinants		4.1 Vector Spaces and Subspaces
March 26	SPRING RECESS				
April 2	4.2 Null Spaces, Column Spaces, Linear Transformations		4.3 Linearly Independent Sets; Bases		4.4 Coordinate Systems
April 9	4.5 Dimension of a Vector Space		4.6 Rank		4.7 Change of Basis
April 16	5.1 Eigenvectors and Eigenvalues		Questions	EXAM on 3 and 4	5.2 The Characteristic Equation
April 23	5.3 Diagonalization		5.4 Eigenvectors and Linear Transformations		6.1 Inner Product, length, orthogonality
April 30	6.2 Orthogonal Sets		6.3 Orthogonal Projections		6.4 The Gram-Schmidt Process
May 7	6.5 Least Squares		7.1 Diagonalization of Symmetric Matrices		Questions