

**Syllabus for MTH U371: Linear Algebra
Fall 2007**

This is a first course in linear algebra. The course introduces some of the basic concepts, algorithms, theory, and applications of linear algebra.

Instructor: Marc Levine, 435 LA, ext. 3899, m.levine@neu.edu

Office hours: MWTh 10:30-11:30 a.m., or by appointment.

Text: *Linear Algebra with Applications* (3rd ed.), O. Bretscher, 2005.

Homework assignments: The homework problems are the heart and soul of the course. They will be assigned from the text at the end of each class.

Exams: In addition to the final exam on December **, there will be five in-class exams, to be held on

Sept. 20, Oct. 4, Oct. 25, Nov. 8 and Nov. 29

Grading: The course grade will be determined as follows:

- In-class exams 60%
- Final Exam 40%

Class web page: We will have a class web-page, at

<http://www.math.neu.edu/%7Elevine/U371.F07/home.html>

Course topics:

Chapter 1 Systems of linear equations, Gauss-Jordan elimination, vectors and matrices

Chapter 2 Linear transformations and their inverses, geometry of linear transformations

Chapter 3 Subspaces, image and kernel, linear independence and bases, dimension

Chapter 5 Projections, orthogonal bases, Gram-Schmidt process, QR-factorization, orthogonal transformations and matrices, least squares approximations and data fitting, inner product spaces

Chapter 6 Determinants and their properties

Chapter 7 Computation of eigenvalues and eigenvectors

Additional topics may be chosen from the following:

Chapter 7 Dynamical systems, complex eigenvalues, stability

Chapter 8 Symmetric matrices, quadratic forms, singular value decomposition

Various policies:

- You can receive extra help (a) from me, either during my office hours or by appointment (b) from the Tutoring Center, 540B NI, MTW 10:00 a.m.-9:00 p.m., Th 10:00 a.m.-6:00p.m., F 10:00 a.m.-1:00 p.m., or the Peer Tutoring Center, 242SL.
- All exams and the final will be closed-book with no calculators allowed; a reference sheet will be allowed for the final.
- Without prior notice, there will be **no makeups** of exams.
- The following are acceptable reasons for rescheduling a quiz, midterm or final exam: serious, documented medical incapacity, university sanctioned events such as team sports for which the athletic department issues a statement requiring your participation, or documented legal requirements such as jury duty or military service. Documentation must be from an appropriate authority other than a parent and must be presented to me at least two days before the scheduled quiz or test.
- You are responsible for **all** information conveyed in class (even if you are absent) or posted on the class web-page.
- If you have a concern about the class that cannot be resolved by speaking with me, please see the Undergraduate Director of the Math Department, Prof. Martsinkovsky, 471 LA, x 5510, alexmart@neu.edu.
- All students with legitimate conflicts that have been approved in advance by the instructor must take the final exam at the scheduled time. Do not make travel plans that conflict with the final exam.
- It is University policy that no grade, including an Incomplete, can be changed after one year, exceptions must be authorized by the Academic Standing Committee.
- An Incomplete grade is given only when a student who has at least a *C* grade is unable to finish a relatively small part of the course *due to circumstances clearly beyond her or his control*. Example: you cannot take the final exam because you are in the hospital. Non-example: You realize around Thanksgiving that there is no way you can get a B in the course, even if you ace the final.
- I reserve the right to make changes in the syllabus at any time. This includes homework assignments, exam dates, material covered, and grading policy. It is your responsibility to be aware of these changes as they are announced in class.

Homework problems

Suggested Homework Problems:

HW#	Section	Problems	
1	1.1	Linear systems and their geometry	1,7,10,20,21,34
2	1.2	Matrices, vectors, Gaussian elimination	2,4,5,7,18,20-22,29-31,34,35,41
3	1.3	Solutions of linear systems, matrices	1-8,10-15,21-32,34,36,47,55
4	2.1	Linear transformations, inverses	1-3,5,6,9,24-30,35,42
5	2.2	Geometry of linear transformations	1,4,6-10,17,19,21,23-26,49
6	2.3	Inverse of a linear transformation	1-5,17,19,25,35-41(odd only)
7	2.4	Matrix products	3,5,11,13,16-25,29,47,65,76
8	3.1	Subspaces, image and kernel of a linear transformation	1,3,5,7,10,14,15,23,25,33,35,42,53,54
9	3.2	Subspaces, linear independence, bases	1,3,11-33(odd only),24,37,39,46,49,52
10	3.3	Dimension of a subspace	1,3,5,7,11,13,17,21,23,27,37,39,49,52
11	5.1	Orthogonal projections, orthonormal bases	1,3,5,13,15,17,27,35
12	5.2	The Gram-Schmidt process, QR-factorization	5,7,19,21,33,35
13	5.3	Orthogonal transformations and matrices	5-8,13-17,27-29
14	5.4	Least squares and data fitting	8,11,13,17-25,31-33
15	5.5	Inner product spaces	1,2,3b
16	6.1	Determinants	1-11(odd only),17,27
17	6.2	Properties of determinants	1,6,24-26,31
18	7.1	Eigenvectors, iterated matrices	1-7,9,15-22,34
19	7.2	Finding eigenvalues	1-13(odd only),28
20	7.3	Finding eigenvectors	1-13(odd only),21,44,46
21	7.4	Diagonalization	1,3,5,17,31,33,35,41
22	7.5	Complex Eigenvalues	1,2,5,8,20,23
23	7.6	Stability	1,11,17
24	8.1	Symmetric matrices	1,3,7
25	8.2	Quadratic forms	1,4,9
26	8.3	Singular value decomposition	1,2,4