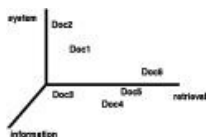


*“Mathematics is 98% Linear Algebra”*

– Jeff Fox, Ph.D., University of Colorado

# Math 206: Linear Algebra



**Spring, 2009**

**Monday, Tuesday, Wednesday, & Friday 11:00-11:50 a.m.**

**Buttrick G-23**

Dr. Alan Koch

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**Office Hours.** Mondays, 10:00-11:00, Tuesdays, 12:00-1:00, and Wednesdays, 12:00-1:00 (you must figure out for yourself which are “a.m.” and which are “p.m.”). If your schedule does not permit you to come at these times, we can set up an appointment.

## Course Information

**Text.** *Linear Algebra and its Applications*, 3<sup>rd</sup> edition, by David C. Lay.

**Course Content.** Chapters 1-7 of the text. Topics include matrices, systems of linear equations, determinants, vectors, vector spaces, higher-dimensional geometry, linear transformations, inner product spaces, eigenvalues and eigenvectors, diagonalization, and applications.

**What is “Linear Algebra”?** It is exactly what the name suggests. Simply put, it is the algebra of systems of linear equations. While you could solve a system of, say, five linear equations and five unknowns, it might not take a finite amount of time. With linear algebra we develop techniques to solve  $m$  linear equations and  $n$  unknowns, or show when no solution exists. We can even talk about situations where an infinite number of solutions exist, and describe them geometrically.

Big deal, you say? You’d be surprised. As the quote at the top of this syllabus explains, much of mathematics uses linear algebra, either directly or indirectly. For example, each of the following mathematics topics uses linear algebra to some degree:

- |                          |                              |                       |
|--------------------------|------------------------------|-----------------------|
| ➤ Abstract Algebra       | ➤ Algebra (the regular kind) | ➤ Analytic Geometry   |
| ➤ Calculus               | ➤ Chaos Theory               | ➤ Cryptography        |
| ➤ Differential Equations | ➤ Fractal Geometry           | ➤ Game Theory         |
| ➤ Graph Theory           | ➤ Linear Programming         | ➤ Operations Research |

In addition, we also get to do some cool things, like do geometry in 4, 5, or even 31-dimensional space!

Aside from being useful to mathematicians, there are plenty of applications of linear algebra to other fields, for example

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Aerodynamics	Anatomy	Business
Chemistry	Electrical Engineering	Economics
Forest Management	Genetics	Image Processing
Physics	Population Dynamics	Robotics

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Hey, those forests don't manage themselves...

**Course Goals.** By the end of the semester, you should:

- Perform linear algebra calculations.
- Develop an understanding of the philosophy behind higher dimensional mathematics.
- Have a working familiarity with and an appreciation of *Maple*.

**Attendance.** You are expected to attend every class. Missing class days does not have a direct impact on your grade, however it will have an indirect impact on your grade. Trust me. Also, you will not be penalized directly for tardiness, however you are expected to arrive to each class on time, and assignments are due *in class* at the start of the class.

**Blackboard. Moodle.** We are experimenting with a new Course Management program. The site on Moodle <http://magnus.agnesscott.edu/course/view.php?id=11&sesskey=SN2GzA9qJG&switchrole=5> will have all the handouts for the course. You can also get to this through the Blackboard site – in fact, it's the only thing you can do from the Blackboard site.

**Q&A.** Six days this semester are designated “Q&A”. On these days, we will have time for you to both ask and answer questions. We will take as many questions as possible, so make sure you come prepared.

# Assessment

Here's how you'll be graded...

**Homework.** Each night, there will be homework problems assigned from the sections covered during the lecture. They will consist (primarily) of odd problems from the book, so you can check your answers in the back. This homework will not be collected, but it is assumed that it will be completed by the start of the next class. You are encouraged to work with other people in the class to solve problems. You won't be graded on this, but it seemed like a good place to put this info.

**Assignments.** There will, however, be three assignments that will be turned in. These assignments are designed to help you keep up with the material. As a word of warning, the assignments do not fully cover the scope of the class, and you should not use them as a substitute for daily homework assignments. Assignments are due *in class* by the start of class on the day indicated at the top of the problem set. Late assignments will not be accepted.

You are encouraged to discuss these assignments with the others in the class, but your write-up must be your own. If you have any questions about this policy, please let me know.

**Projects.** In addition, there will be three projects that use the computer algebra package *Maple*. *Maple* is a piece of software (installed on all of the school's public computers) that does a lot of the more tedious matrix calculations. You do not need to know how Maple works – you will receive a tutorial early in the semester. The purpose of these projects is to shift the focus from calculation to analysis. We will use Maple to do some nice applications of linear algebra. For the projects, you are encouraged to work with another person. You may turn in one combined assignment. Teams of three or more are not allowed. You will not have class time to do the projects.

**Tests.** You will have three in-class exams. They are (tentatively) scheduled for Monday, February 16; Tuesday, March 17; and Friday, April 17. Please plan your schedule accordingly.

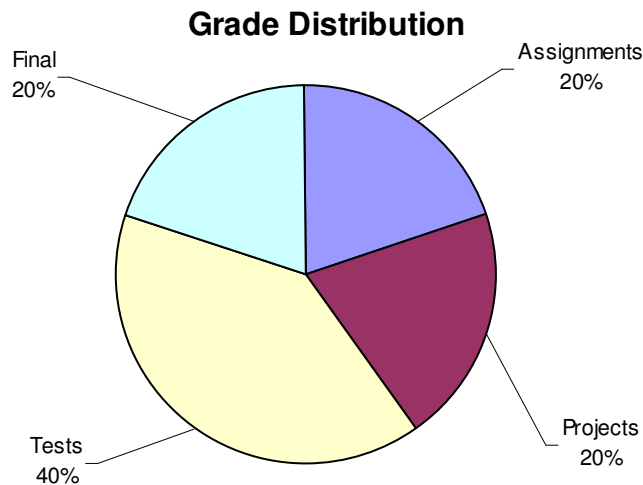
You are forbidden from using your textbook or your notes or any other sources (including people, of course). Again, all tests must be pledged. The exams will cover material from the text, along with material presented in class.

**Final Exam.** The final exam is cumulative, although there will be more of the material since Test #3 for obvious reasons. It will be self-scheduled, like most of the exams at Agnes Scott College. The same rules apply as with other exams: you can use your calculator, pencil, exam, and the hand you use to write.

**Course Evaluations.** The completion of course evaluations is an expectation of students in this class. Near the end of the semester you will be notified by e- mail and provided with a link to follow to complete the evaluations on line outside of class. Your feedback on the course is extremely valuable. You are responsible for completing an evaluation of the course at the end of the semester.

**Honor Code.** All students are expected to follow the honor code throughout the semester. Any graded work, be it an assignment, test, or project, must be pledged (and signed) in order for it to be graded. Please consult the student handbook for more details.

# Grade Information



## Point Scale

A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F
92 - ∞	90 - 91	88 - 89	82 - 87	80 - 81	78 - 79	72 - 77	70 - 71	68 - 69	62 - 67	60 - 61	- ∞ - 59

You should not expect a curve to be applied to the point scale, unless you happen to love being disappointed.

# Tentative Schedule

Note: Intervals represent odd problems unless otherwise specified.

Date	Section(s)	Homework / Comments	Date	Section(s)	Homework / Comments
Tue Jan 13		You are here.	Mon Mar 9		
Wed Jan 14	1.1	p. 11: 1-21, 25-33, 34	Tue Mar 10		<b>Spring Break</b>
Fri Jan 16	1.2	p. 25: 1-19, 23-31	Wed Mar 11		
Mon Jan 19		<b>Martin Luther King Jr. Day</b>	Fri Mar 13		
Tue Jan 20	1.3	p. 37: 1-21, 27, 29, 33	Mon Mar 16		Q&A
Wed Jan 21	1.4	p. 47: 1-21, 25, 29, 33-39	Tue Mar 17		<b>Exam 2</b>
Fri Jan 23	1.5	p. 55: 1-13, 17-21, 25, 27, 33-39	Wed Mar 18	5.1	p. 308: 1-19, 25, 29, 31, 35
Mon Jan 26	1.6	p. 63: 1-9	Fri Mar 20		
Tue Jan 27	1.7	p. 71: 1-19, 23, 27, 31, 39	Mon Mar 23	5.2	p. 317: 1-19
Wed Jan 28	1.8	p. 79: 1-19, 25-35	Tue Mar 24	5.3	p. 325: 1-19, 23-27, 31
Fri Jan 30	1.9	p. 83: 1-21, 25-31, 35	Wed Mar 25	5.4	p. 333: 1-25, 29, 31
Mon Feb 2	1.10	p. 99: 1, 3, 9, 11	Fri Mar 27	5.8	p. 368: 1-5, 11, 21
Tue Feb 3		Q&A	Mon Mar 30		Q&A
Wed Feb 4			Tue Mar 31	6.1	p. 382: 1-17, 21-31
Fri Feb 6	2.1	p. 116: 1, 3, 7-11, 19, 23-27, 31	Wed Apr 1	6.2	p. 392: 1-21, 27-33
Mon Feb 9	2.2	p. 126: 1-7, 8, 11-19, 23, 24, 25, 29, 31	Fri Apr 3	6.3	p. 400: 1-19, 23
Tue Feb 10	2.3	p. 132: 1-7, 13, 15, 19-35	Mon Apr 6	6.4	p. 407: 1-15
Wed Feb 11	2.5	p. 149: 1-9, 15, 17, 21, 25	Tue Apr 7	6.5	p. 416: 1-15, 23, 25
Fri Feb 13		Q&A	Wed Apr 8	6.6	p. 425: 1-5, 9
Mon Feb 16		<b>Exam 1</b>	Fri Apr 10		<b>Easter Break</b>
Tue Feb 17	3.1	p. 190: 1-37	Mon Apr 13	6.7	p. 435: 1-15, 19-25
Wed Feb 18	3.2	p. 198: 1-25, 29-43	Tue Apr 14	6.8	p. 443: 1-13
Fri Feb 20	4.1	p. 223: 1-21, 23-31	Wed Apr 15		Q&A
Mon Feb 23			Fri Apr 17		<b>Exam 3</b>
Tue Feb 24	4.2	p. 234: 1-23, 27, 31-35	Mon Apr 20	7.1	p. 454: 1-23, 27-31, 35
Wed Feb 25	4.3	p. 243: 1-15, 19, 23-29, 33	Tue Apr 21	7.2 I	
Fri Feb 27			Wed Apr 22		<b>Spring Annual Research Conference</b>
Mon Mar 2	4.4	p. 253: 1-13, 17, 21, 23, 24, 25, 27-31	Fri Apr 24	7.2 II	p. 432: 1-13, 19, 23, 24, 27
Tue Mar 3	4.5	p. 260: 1-17, 21-27	Mon Apr 27	7.3	p. 470: 1-11
Wed Mar 4	4.6	p. 269: 1-15, 19-27	Tue Apr 28		Q&A
Fri Mar 7	4.7	p. 276: 1-9, 13	May 1-6		<b>Final Exam</b>