

MATHEMATICS 2270

Introduction to Linear Algebra

Spring Semester 2010

Time: Tuesday–Thursday, 4:35-6:15pm, JTB 130

Instructor: Professor Grant B. Gustafson¹, JWB 113, 801-581-6879.

Office Hours: JWB 113, TH 3:30-4:20pm. Other times will appear on my door card. From computers, read the door card link at the course web site below.

Telephone: 801-581-6879. Please use email whenever possible.

Email: ggustaf@math.utah.edu

Web Site: <http://www.math.utah.edu/~gustafso/>

Texts:

Otto Bretscher, *Linear Algebra with Applications*, Fourth Edition, by Otto Bretscher. ISBN=978-13-600926-9. Prentice-Hall 2009 (the required text).

Student Solution Manual, for Otto Bretscher's text *Linear Algebra with Applications*, 4th edition. A copy is available in the math center.

Web documents for 2270, by GB Gustafson, at web site www.math.utah.edu/~gustafso. All are pdf or text documents that can be printed from mozilla firefox, opera, safari or MS iexplorer web browsers.

Prerequisites

Math 1210 and 1220 or the equivalent (Calculus I and II). This is first-year Calculus, with a very brief introduction to linear differential equations. The old Math courses 111-112-113 of 1997-98 fulfill the requirement. In addition, background is required in planar curves, velocity and acceleration vectors from Physics 2210 or Math 2210 (Calculus III), or their equivalent courses.

A passive knowledge of `maple` is assumed. Persons without the passive knowledge of `maple` and `unix` may attend one of the *tutorials* on the subject offered during the first two weeks of the term. The tutorials are organized by Angie Gardiner, 801-585-9478, gardiner@math.utah.edu. Angie's web page is www.math.utah.edu/ugrad/tutoring.html. Her office is MC 155A in building LCB.

Persons without computer training and no `maple` experience can survive for the first five weeks with a graphing calculator and Microsoft's `Excel` or the MathWork's `matlab`. Free software exists for PC Intel hardware to duplicate most of `matlab`'s functionality. Only `matlab` has a licensed `maple` engine, and this is the main reason why `matlab` provides a route through the course, without learning a lot of `maple` details.

¹Pronunciation: In the phrase `Gust of Wind` change `Wind` to `Sun`

Tutoring

The Math Department Tutoring Center is located in LCB, and it is open for free tutoring from 8 a.m. to 8 p.m. on M-Th, and from 8 a.m. to 6 p.m. on Friday. Some, but not all of the math tutors welcome questions from Math 2270 students. To see the times and specialities of various tutors, consult the web address www.math.utah.edu/ugrad/tutoring.html.

Course material and requirements

This course is an introduction to linear algebra for mathematics majors and science majors. Chapters 1-9 in the Bretscher text plus class notes and [www](#) documents will make up the course material. If you study in isolation, then please know that some topics are enriched in class. Your grade in the course may be reduced by isolation, because the enriched material is tested on exams.

Grading:

Final grades will be based on:

- **Dailies.**

Textbook problems. They are the major part of the **dailies**. About 142 individual textbook problems will be graded.

Three computer projects. They form the minor part of the **dailies**. Each project is counted like several textbook problems.

About six of the 150 total textbook and maple problems are dropped to make 144 required items. Dailies will be graded by G.B. Gustafson and possibly by Angie Gardiner's grading staff.

- **Midterms.** There are two written midterm examinations.

Midterm 1: Thursday February 25, 2010 after 5pm, in JTB 130.

Midterm 2: Thursday April 22, 2010 after 5pm, in JTB 130.

Send notification in advance of the exam date, if know that you will miss the exam. Email ggustaf@math.utah.edu is best. Phone 801-581-6879 works too. Please know that once you miss the exam, the crisis has ended, and recovery is the next plan. Please respond ASAP.

- **Final exam.** This in-class 2-hour examination counts as two additional midterm scores. It is scheduled by the university, in JTB 130 from 6pm to 8pm, on the first Tuesday during exam week, May 4.

Records:

Accounting of exams and the dailies is initially on paper and ultimately by **excel** computer records. The electronic records are web-based, with keys replacing names. During the course, the currently available electronic record is printed and distributed in class like returned homework. This usually happens about the last day of class or shortly thereafter. Electronic records are available later, on the web.

If you ask for record information before it is electronic, then the request involves 10-15 minutes of your time, to retrieve it from my paper records. Please keep your own records. Correction of records, when required, can be made by email communication.

Homework, computer labs, midterms and final

Textbook problems

Those problems to be submitted for grading are listed on the **gradesheet** for the course and also at the end of the syllabus. Visit the web site for extra copies. The due dates for problems appear only on the web site. They are dynamically updated to reflect the reality of what was discussed in class. Generally, problems are submitted shortly after class discussion.

Homework problems, written in your own handwriting, are submitted in one stapled package with your name and class time 4:35pm in the upper right corner of the top page. A problem label is expected for each problem solved, e.g., **1.2-5** for problem 5 in section 1.2 of Bretscher's textbook.

There are certain **suggestions** for writing up the textbook problems. A full accounting of the *format suggestions* contributed by students of 2250 appears on the internet course page as *suggestions for improving your submitted work*. Kindly apply the ideas therein to your written work. It is not a requirement that you follow any advice, but rather, a suggestion that you may rob successful ideas from the document aforementioned.

Computer projects

There will be three computer projects assigned during the semester, related to the classroom material. Each project counts the same as 2 or 3 daily problems from the textbook, for a total of 8 scores on the dailies. They will be written by hand and use the software package **maple**.

Packaging rules for homework problems apply to maple labs as well.

The reason for the maple labs is to give you a tool for checking answers, and for doing elaborate linear algebra computations, error-free.

There is a Math Department Computer Lab, part of the *Math Center* in building LCB, at which registered students automatically own accounts. There are other unix labs around campus where **maple** is also available, for example at the College of Engineering CADE lab. Most unix labs can launch remote X-windows sessions on math hosts using **ssh**. Remote files on math hosts can be transferred to your local unix computer with **sftp**. For information on how to do the same for personal computers, visit the campus computer help sites.

Drop-in tutoring in the *math center* in the basement of building LCB starts the second week of the semester. The staff there is best at elementary topics from algebra and calculus. A few of them can handle 2270 questions.

Midterm exam details

Past midterm in-class exams appear on the web. Your exam is modeled after the old exams. All parts of the exam will be in-class. There is no take-home portion during Spring 2010. The take-home exams you find on the web from Fall 2008 were caused by a week missed from work – it was an unusual event, unlikely to repeat.

A sample exam will be supplied. Available on the web page are solution keys to old exams. You may print these for reference. The final exam has a separate study guide, also available at the site.

Books, tables, notes and calculators are not allowed on exam day.

An in-class Midterm exam has different presentation rules, and none of the textbook problem rules apply in this case. Basically, the in-class exam is a first draft. No answer checks are expected.

Final exam details

Two hours are reserved for this written exam. As published by the university, the final exam is

2270-2 Tuesday May 4, 2010 in JTB 130, 6-8pm

The final exam is comprehensive. It covers chapters 1 through 9 with weight distributed evenly. A study guide consisting of problem types by chapter plus a few final exam solution keys for previous final exams appear at the web site.

No notes, calculators, tables, books or aids of any kind are allowed on the final exam. Please bring pencils and eraser. Paper will be supplied.

Due dates, extra credit and late work

Due dates

Please prepare submitted work according to the tentative schedule of due dates. The actual due date is the same date, or one day later, as documented on the web site.

Due dates are updated dynamically at

www.math.utah.edu/~gustafso/s2010/2270duedateS2010.html.

Browse this site often. To repeat: **the due dates are not given in class!** Sometimes, email communication about due dates and exams will be made from the registrar's list.

Email notification

You will be sent email about due dates, exam reviews and exam dates during the semester. This service depends on your email address being up to date.

Look up your campus information data by visiting the registrar's campus WWW site (where you add classes). Find out your email address, then test it by emailing a message to yourself. To update the information, return to the registrar's site and edit your personal data.

When is work late?

Due to the number of dailies being collected, work is considered late when the stack of papers is graded. Papers not in the stack get a zero for the assignment. The zero can be made up by doing extra credit problems.

Are you an exception? It is better to ask than to assume anything. Depend on extra credit problems (see below) to make up for work not submitted on schedule. The same advice applies, if submitted work earns a grade less than 100.

The state of submitted work is locked at the point when the stack is graded and recorded. The grading filters out the good work from the bad work and records the result. This record is never appended, it is only corrected for errors.

The lowest six (6) dailies are dropped from consideration in order to eliminate makeups. There is no distinction between a problem from the textbook and a maple lab problem, they earn the same credit.

If more than ten (10) textbook problems have zero scores, then please call 581-6879 or email ggustaf@math.utah.edu and discuss the situation. It is better to talk about it and collaborate on a plan than to try to catch up by yourself.

Extra credit

Extra credit problems are in PDF files by chapter at the web site. They are not textbook problems and they do not explicitly appear in this syllabus. Instructions for extra credit problems appear at the end of this document, just before the lecture and homework list. Briefly, the deadline for extra credit in a chapter is the due date of the last problem in the next chapter.

Withdrawal

It is the Math Department policy, and mine as well, to grant any withdrawal request until the University deadline. This promise also means that such a withdrawal requires no explanation. Withdrawals are always initiated by the registered student. All paperwork is the duty of the student. My job is the signature.

ADA statement

The American with Disabilities Act requires that reasonable accommodations be provided for students with physical, sensory, cognitive, systemic, learning, and psychiatric disabilities. Please contact me at the beginning of the semester to discuss accommodation (113 JWB or 581-6879), which is to say, accommodation shall be made.

It is the Math Department policy, and mine as well, to grant any withdrawal request until the University deadline. This promise also means that such a withdrawal requires no explanation. Withdrawals are always initiated by the registered student. All paperwork is the duty of the student. My job is the signature.

ADA statement

Grading details

Grading Scale: The letter-to-percentage scale is uses GPA increments, which step 1/3 from 0.0 = *E* to 4.0 = *A*. Briefly, $A = 95$, $B = 82$, $C = 67$, $D = 52$. In detail:

$A = 95-100$, $A^- = 90-94$, $B^+ = 85-89$, $B = 80-84$,
 $B^- = 75-79$, $C^+ = 70-74$, $C = 65-69$, $C^- = 60-64$,

$$D+ = 55-59, D = 50-54, D- = 45-49, E = 0-44.$$

The scale is used for grading exams and for final letter grade reporting. This scale is for internal use only. Fractional scores are truncated (not rounded) when fitting a score to a letter grade – see below for examples.

Final grade

A grade of *E* is assigned if the Dailies score sums to less than 6000, which is 60 problems, or 40% of the required dailies. Please read the **Rite of passage** paragraph below.

The letter grade is determined from the *Grading Scale* above as follows:

$$\text{Final Grade} = \frac{30}{100}(\text{Dailies Average}) + \frac{70}{100}(\text{Midterm+Final Average}).$$

An example: the Dailies Average for 144 textbook problems and maple labs is 91% and the Exam Average of the two midterms and the final exam is 87%. The final grade is $0.3(91) + 0.7(87.5) = 87.55\%$, which by the scale above is a *B+*. While 87.55 rounds to 88, a *B+*, it is close to an *A-*. The deciding factor is the exam average of 87.5, which is squarely a *B+*. The final grade is *B+*. If the dailies average was 96 or higher, then the final grade would be 90.05 or higher, which is an *A-*.

A precise description of the method of assigning letter grades follows. First, compute the course average $A = 0.3A_1 + 0.7A_2$ from the dailies average A_1 and the exam average A_2 . Truncate A to an integer (e.g., $A = 94.96$ truncates to 94). Assign a letter grade L according to the grading scale (see above). Look at the final exam score F and the exam average A_2 . If F would give a higher letter grade, then change L to the next possible higher letter grade, e.g., change a *B+* to an *A-* (but not *B+* to *A*). In some cases, when F is low or A_1 is low, the average A_2 will be used to decide on the letter grade. An example: $A = 94.96$, $F = 92$, $A_1 = 94.86$, $A_2 = 95$. The letter grade is *A-*, but the exam average is 95 or *A*, therefore the letter grade *A-* should be promoted to an *A*.

It is possible with a very low daily average to have rank one or two in the class and yet earn a final grade of **B**. This happens because the influence of the dailies score is just 30%. An example: final exam grade 100, exam average 99, dailies 50. Then

$$0.3 * 50 + 0.7 * 99 = 84.3 = \mathbf{B}.$$

Rite of passage

A passing grade in the course requires submission of at least 60 of the 150 dailies (dailies include computer projects). A grade of *E* is assigned if less than 60 Dailies are submitted. The scores on the 60 dailies are expected to be 100%. This requirement is met by submitting dailies for chapters 1 through 4, each with a grade of 100.

The right of passage is absolute, similar to the European system, which requires a body of work to be presented before written and oral final exams are taken. For example, the Czech *vypočet* is a requirement to show a body of completed work as the entrance requirement to administration of written and oral final exams.

How dailies are graded

Grading assigns scores on dailies as one of 100, 55 or 0. The papers with score 55 or 0 are used to schedule office hours or additional tutorial help. Based on grading history, about 90% of the scores on a given problem are 100%. A score of 0 is given for work not submitted.

A grade of 100 usually means a complete, correct solution was written. The score is 100 when the solution method is correct, even if the details contain arithmetic errors and a few missing steps. Flaws in logic are not excused, even if the correct answer was found, due, for example, to multiple errors canceling the logic error.

A grade of 55 means the written work lacked essential details. This score is given for a written solution with just the answer and a few sketchy details. Examples of sketchy solutions, worth 55 or 0 for a score, appear in the textbook's solution manual.

Extra credit problems

The actual problems are in PDF files organized by chapter, at the course web site. They appear nowhere else. Possible because of them is 100% credit on each chapter and 100% on each maple lab.

Grades on extra credit problems and extra credit maple lab sections are 100 and 0. Generally expect an extra credit problem to be more difficult than the standard assignment.

To illustrate how credit is applied, suppose that a chapter has 15 dailies and 5 extra credit problems. Consider this record:

Problem Count	Score	
9	100	full credit
3	55	errors found
3	0	unsubmitted
4	100	extra credit

Then the average on the chapter is the smaller of $(9 * 100 + 3 * 55 + 4 * 100)/15 = 97.7$ and 100. The fifth extra credit problem could add 100, then the average is 100.

Extra credit is applied to each chapter individually. For example, an extra credit problem like XC1.2-12 applies only to chapter 1.

Purpose of the textbook problems

The *purpose* of the problems is to practice doing mathematics, that is, to write out in detail the solutions to problems. A textbook problem is generally an engineering-style “crank” problem or a linear algebra proof. The process:

- **Understand the problem.** Understanding usually involves reading the *problem notes* and the textbook. Answers are usually not provided. You may get an outline of the solution, to increase the probability that the project gets completed on schedule. Problems are discussed in class in finer detail. If slides are used, then they are at the web site, as pdf files, ready to print from an internet browser.

- **Background reading.** To solve a problem, a second opinion of the theory and method is essential. It might be that you can flesh it out of your book's examples, the college algebra text, the calculus text or some mathematics textbook. No matter, go to a source that works for you. This is *reading* and not a tutorial.
- **Scratch Paper Write-up.** The initial creation of a solution is the essence of the learning process. Everyone learns by repetition, and here is where you do it. Use a pencil and a big eraser, lots of paper, and flesh out a first draft at full speed. Don't submit this draft!
- **Final Copy.** The final copy of the solution uses the scratch paper draft as raw material to *present* the details of the solution. As such, it is more than a collection of formulas on paper. There is no strict requirement, except that *neatness* and *completeness* are a must.
- **Final Copy Format.** The most successful format to date was invented by several engineering mathematics students over the years 1990–2008. This format is described in some detail below and also in the internet document *format for submitted work*.

Some Format Suggestions

1. Use engineering paper or plain white paper. Lined notebook paper and graph paper are unacceptable for mathematics, because they introduce flaws in vertical white space.
2. Reports are hand-written in pencil. They start with a problem statement followed by the book's answer or by a final answer summary. Supporting material appears at the end, like a tax return.
3. Every report has an answer check. For problems with textbook answers, it is usual to see "*the answer matches the textbook*," or briefly **B.O.B.** Except for proofs and computer graphics, problems without a textbook answer are expected to have a full answer check.
4. Mathematical notation is on the left, text on the right, about a 60% to 40% ratio. One equal sign per line. Justify equations left or align on the equal signs.
5. Text is left-justified on the right side. It includes explanations, references by keyword or page number, statements and definitions, references to delayed details, like long calculations, graphics and answer checks.
6. Rules 4 and 5 can be broken. They are suggestions, not rules.

Cooperative efforts are allowed and encouraged. Kindly produce individual handwritten reports. There is no penalty for getting help from others – it is encouraged. This includes tutorial staff in the LCB Math Center, teaching assistants and fellow students.

English language deficiencies are tolerated but not excused. If English is your second language, then try to improve your writing skills by these actions: (1) shorten comments, and (2) use page references to the textbook.

Presentation is expected to improve throughout the 14 weeks of the course. You are not expected to be an expert in the first week. Correctness of answers will be checked. The problem notes might contain answers plus a solution outline. In class, further details are communicated. Your job is to *improve* on the initial start into the solution. Add the particulars, make comments, and

chase down the details from previous background courses. College algebra and calculus skills need constant and careful review. Writing up the solution identifies the stumbling blocks and forces a review of background material.

References are required on the first occurrence. After that, omit the citation. It is appropriate to refer to the previous assignment on which the citations originated. A statement like *References parallel Exercises 1-5* is enough.

Saving Paper. It is a good plan to save paper by putting multiple problems on a page and using the back side of the paper. Such paper should be xerox paper, and not lined paper. Engineering paper can only be written on one side. Graph paper should never be used. Lined filler paper is not for mathematics – it is for English composition (and it makes good packing material).

Saving Time. Write your work in pencil and use a big eraser. Use maple to check answers, and print a worksheet appendix to save re-writes.

Extra credit instructions

Extra credit problems add credit to the chapter in which they appear. They do not add credit to any other chapter. There are extra credit problems available for chapters 1 to 5, currently. More will be added, as necessary.

The maximum credit that can be earned in a chapter is 100%. An example:

Standard problems and maple labs might total 1600 for a chapter, which counts as 16 items on the gradesheet. Extra credit problems could potentially add 5 times 100 or 500. If 1355 was earned on standard problems and maple labs, plus 300 on extra credit, then the total earned is $(1355 + 300)/16 = 103.4$. This total is truncated to 100, because you may earn no more than 100% for a chapter.

Location. The web site <http://www.math.utah.edu/~gustafso/index2270.html> has a link to the possible extra credit problems for each chapter. They do not appear in the syllabus nor the gradesheet, which reference only standard problems and maple labs.

Submissions. Please submit extra credit problems with a special label. To illustrate, extra credit problem **1.2-12** would be submitted with label **XC1.2-12** next to your name. Kindly put the class time 4:35pm on the top sheet. Staple the work into one package.

Deadline. The deadline for submitting extra credit is one week after the first problem set of the next chapter is collected. The extra credit stack is graded on that date. The records are then locked and never appended, only corrected. This deadline might be extended, depending on the rate that dailies are returned. If so, then the new deadline will appear on the due dates page at the web site.

Spring 2010 Tentative Daily Schedule

Week 1, Jan 11-15	Section 1.1,1.2,1.3. Solving linear systems of equations.
Week 2, Jan 19-22	Sections 2.1,2.2,2.3. Begin first maple lab. Vector, dot product, vector space, linear transformation, inverse, geometry, matrix operations.
Week 3, Jan 25-29	Sections 2.4,3.1,3.2. Kernel, image, subspace, independence, basis, pivot theorem.
Week 4, Feb 1-5	Sections 3.3,3.4. Dimension. Coordinates.
Week 5, Feb 8-12	Sections 4.1,4.2. Vector space, linear transformation, isomorphism, matrix of a linear transformation.
Week 6, Feb 16-19	Sections 4.3,5.1,5.2. Orthonormal basis, Gram-Schmidt process, QR-factorization.
Week 7, Feb 22-26	Section 5.3. Exam 1 Thu Feb 25. Orthogonal transformation, projection, normal equations, near point theorem.
Week 8, Mar 1-5	Sections 5.4,5.5. Data fit, least squares, four fundamental subspaces, inner product, Fourier series.
Week 9, Mar 8-12	Sections 6.1,6.2,6.3,7.1. Determinant, adjugate formula, cofactor, 4 Rules, Cramer's rule. Discrete dynamical systems.
Week 10, Mar 15-19	Sections 7.1,7.2,7.3. Eigenanalysis, diagonalization.
Spring Break: Mar 20-28	Happy Holiday!
Week 11, Mar 29,30,31, Apr 1,2	Sections 7.4,7.5. Complex eigenvalues, stability.
Week 12, Apr 5-9	Sections 7.6,8.1. Symmetric matrix.
Week 13, Apr 12-16	Sections 8.2,8.3. Spectral theory. Quadratic forms. Singular value decomposition.
Week 14, Apr 19-23	Sections 9.1,9.2. Exam 2 Thu Apr 22. Dynamical systems. Linear differential equations.
Week 15, Apr 26,27,28	Section 9.3, Final Exam review. Dynamical systems applications. Lectures end Apr 28.
Week 16, May 4	Final exam. Final exam for the 4:35pm class is 6-8pm in JTB 130 on Tuesday May 4, 2010.

Recommended Problems for Bretscher's 4th Edition

These problems should be examined for content and solved as part of the reading of Bretscher's textbook. Solution sketches to some of the problems can be found on Nick Korevaar's web page <http://www.math.utah.edu/korevaar/>. Problems to be submitted appear on the next page.

1.1 3, 6, 11, 13, 14, 20, 21, 24, 27, 28, 29, 44;

1.2 1, 3, 9, 10, 16, 17, 18, 20, 21, 24, 25, 29, 30, 32, 34, 35, 37, 38, 41;

1.3 1, 5, 6, 7, 9, 11, 13, 14, 17, 18, 20, 22, 24, 27, 34, 35, 55;

Ch1 Review problems for Chapter 1: all odd;

2.1 1, 3, 4, 5, 6, 7, 8, 10, 13, 16, 17, 19, 24, 25, 26, 28, 30, 32, 36, 42;

2.2 1, 2, 9, 10, 11, 12, 13, 17, 27, 35, 36, 38, 43, 44, 49;

2.3 1, 2, 5, 6, 16, 29, 33, 34, 38, 45, 48, 49, 50;

2.4 19, 20, 21, 23, 25, 29, 33, 38, , 67, 68, 69, 70, 71, 73

Ch2 Review problems for Chapter 2: 3, 5, 6, 7, 8, 10, 16, 26, 34, 40, 41

3.1 3, 5, 6, 13, 19, 21, 23, 24, 25, 32, 33, 34, 37.

3.2 1, 4, 5, 7, 8, 14, 15, 21, 28, 33, 45;

3.3 6, 7, 18, 21, 25, 29, 32, 36, 37 ;

3.4 1, 3, 5, 6, 11, 14, 15, 16, 17, 21, 22, 31, 33, 43, 53, 56;

Ch3 Review problems for Chapter 3: all multiples of 4, (4,8,12, ...);

4.1 1, 2, 5, 6, 10, 13, 14, 20, 25, 30, 35, 48

4.2 1, 2, 5, 6, 10, 19, 26, 27.

4.3 1, 2, 3, 5, 7, 8, 13, 15, 26, 29, 35, 42, 49;

Ch4 Review problems for Chapter 4: all multiples of 4;

5.1 1, 3, 5, 6, 7, 9, 12, 14, 15, 17, 18, 22, 23, 25, 26, 27, 29, 33;

5.2 3, 4, 13, 17, 18, 27, 29, 32, 33, 35, 36, 42;

5.3 1, 2, 7, 11, 15, 19, 21, 27, 31, 35, 40;

5.4 1, 2, 3, 5, 21, 22, 23, 25, 31, 32, 39;

Ch5 Review problems for Chapter 5: all multiples of 4;

6.1 9, 10, 17, 32, 42, 43, 48, 49;

6.2 1, 2, 9, 11, 15, 16, 17, 30, 31, 32, 35, 37, 38, 44.

6.3 1, 5, 7, , 8, 11, 13, 18, 19, 20, 21, 22, 24, 25, 26, 48;

Ch6 Review problems for Chapter 6: all multiples of 4;

7.1 1, 2, 4, 6, 7, 15-19, 24, 27, 30, 31, 32, 49;

7.2 9, 12, 19, 21, 25, 26, 27, 28, 38.

7.3 7, 13, 20, 23, 27, 28, 35, 36, 38, 44.

7.4 14, 17, 23, 25, 27, 31, 35, 37, 38, 47, 54.

7.5 1, 2, 3, 4, 5, 6, 9, 11, 21, 24, 30, 31, 32, 41, 45, 47;

7.6 1, 3, 4, 11, 12, 17, 20 , 37.

Ch7 Review problems for Chapter 7: all multiples of 6;

8.1 3, 5, 10, 14

8.2 15, 16, 19, 20, 21

8.3 7, 9, 10, 12.

Ch8 Review problems for Chapter 8: all multiples of 6;

Tentative Due Dates for Dailies

Chapter 1 Jan 11-15 Lectures, Sections 1.1, 1.2, 1.3.

19 Jan: Section 1.1, 19, 26, 30, 32

19 Jan: Section 1.2, 7, 18, 22, 27, 28, 30, 42

26 Jan: Section 1.3, 23, 26, 27, 28, 48a

26 Jan: In-class Ch1 Review, 1, 3, 7, 11, 15, 19, 23, 27, 29, 35

Chapter 2 Jan 19-26 Lectures, Sections 2.1 to 2.4.

28 Jan: Section 2.1, 5, 8, 12, 13, 14, 36, 39, 40

02 Feb: Maple, L1.1, L1.2

04 Feb: Section 2.2, 17, 22, 27, 34, 43, 44, 49

04 Feb: Section 2.3, 14, 28, 31, 34

09 Feb: In-class Ch2 Review, 3, 15, 25, 39, 41, 49

09 Feb: Section 2.4, 13, 16, 30, 37, 40, 52, 58, 63, 70

Chapter 3 Jan 27 to Feb 5 Lectures, Sections 3.1 to 3.4.

11 Feb: Section 3.1, 6, 12, 22, 24, 38, 48, 50

11 Feb: Section 3.2, 4, 8, 14, 18, 22, 46, 48

11 Feb: Section 3.3, 10, 24, 52, 64

16 Feb: Section 3.4, 14, 18, 30, 46, 53

16 Feb: In-class Ch3 Review, 28, 44, 49

Chapter 4 Feb 8-19 Lectures, Sections 4.1 to 4.3.

18 Feb: Maple, L2.1, L2.2, L2.3

23 Feb: Section 4.1, 20, 26, 38

23 Feb: Section 4.2, 13, 20, 34

23 Feb: Section 4.3, 2, 30, 60, 64

25 Feb: Exam 1, 5 problems. See sample.

Chapter 5 Feb 19 to Mar 5 Lectures, Sections 5.1 to 5.5.

09 Mar: Section 5.1, 10, 26, 34

09 Mar: Section 5.2, 14, 20, 34

11 Mar: Section 5.3, 11, 20, 26, 30b

11 Mar: Section 5.4, 5, 16, 20 (maple assist ok)

11 Mar: Section 5.5, 10, 24

Chapter 6 Mar 5-12 Lectures, sections 6.1 to 6.3.

18 Mar: Section 6.1, 16, 32, 42, 48

18 Mar: Section 6.2, 13, 31, 32, 35, 38

18 Mar: Section 6.3, 14

Chapter 7 Mar 12 to Apr 9 Lectures, Sections 7.1 to 7.6.

Spring Break is Mar 20-28

06 Apr: Maple, L3.1, L3.2, L3.3

06 Apr: Section 7.1, 10, 34, 49

06 Apr: Section 7.2, 8, 12, 21, 26, 28
13 Apr: Section 7.3, 14, 18, 28
13 Apr: Section 7.4, 16, 18, 31, 38
13 Apr: Section 7.5, 26, 30, 32, 45, 47
13 Apr: Section 7.6, 6, 12, 20

Chapter 8 Apr 9-16 Lectures, sections 8.1 to 8.3.

20 Apr: Section 8.1, 6, 10, 28
20 Apr: Section 8.2, 12, 16, 20
20 Apr: Section 8.3, 14, 17, 18, 26

Chapter 9 Apr 19-28 Lectures, Sections 9.1 to 9.3.

22 Apr: Exam 2, 5 problems. See sample.
27 Apr: Section 9.1, 4, 12, 30, 49
27 Apr: Section 9.2, 12, 24, 32
Not due: Section 9.3, 6, 30, 48
29 Apr: Extra credit problems due by 9pm under the door 113 jwb.
04 May: Final exam 6-8pm JTB 130
See the study guide and sample exams.

Policy on Dailies: The highest 144 dailies will be counted. The lowest 6 of the 150 dailies will be dropped. Any record with less than 60 daily and lab scores earns a grade of E, regardless of midterm and final exam scores. Deadlines set at web site www.math.utah.edu/~gustafso/. Work not in the stack being graded is late and it earns a grade of zero.

Gilbert Strang's Video Lectures

Strang's Linear Algebra 18.06 web page from 2005 is located at

<http://ocw.mit.edu/OcwWeb/Mathematics/18-06Spring-2005/CourseHome/index.htm>

This free site from MIT has video lectures by Gilbert Strang plus a transcript of the audio track, especially appreciated if your native language is not English.

As minimum use of Strang's resources, please examine the quiz solutions and final exam solutions. Strongly recommended are the Challenge problems with solutions, which appear in the homework link.

Reference:

Strang, Gilbert. Introduction to Linear Algebra. 4th ed. Wellesley, MA: Wellesley-Cambridge Press, February 2009. ISBN: 9780980232714.