

MATHEMATICS 2250-1 7:30am
Ordinary Differential Equations and Linear Algebra
Spring semester 2012

Time: MTWHF 7:30–8:20am JTB 140

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

Thursday Lecture: The graduate assistant for 7:30am is Patrick Bardsley, LCB Loft, 801-581-7653, bardsley@math.utah.edu. Patrick meets the 2250 lab in JTB 140 from 7:30am to 9:25am. Midterm exams are given by Patrick in six (6) of these sessions. If you need extra time on exams, then plan to attend at 7:30 and continue until finished or the end at 9:25am.

Office Hours: JWB 113, MTWF 8:40-9:15am and 3:10-4:00pm. Appointments are always appreciated. Other times appear on my door card. From computers, read the door card link at the course web site. Patrick Bardsley also holds office hours for 2250 students.

Telephone: Gustafson: 801-581-6879 [113 JWB]. Please use email whenever possible.

Email: ggustaf@math.utah.edu ,

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

Exam Review and Exam Days: The Thursday 2250 classroom is used for exams on six dates. Otherwise, the graduate student lecturer provides exam review, topic review, drill and tutorials on dailies, and maple lab details. Their main task is **exam review**, which follows a schedule published on the course web site. Please attend as advertised below, e.g., you may attend a different one each week, and close to an exam date, all three. On exam day, please attend on Thursday, usually as early as 7:25am, to give extra time to complete the exam. Exam dates are published on the grade-sheet and also the web site due dates page. Email is sent before each exam, as a reminder.

Exam Review and Exam Day Schedule

Lecturer	Day	Review Time	Location
Gustafson/Bardsley	Thursday	7:30am	JTB 140
Gustafson/Bardsley	Thursday	8:35am	JTB 140
Korevaar/Gaffney	Thursday	10:45am	LCB 219
Korevaar/Gaffney	Thursday	11:50am	LCB 219
Childs/Miller	Monday	12:55pm	JWB 335
Childs/Miller	Monday	2:00pm	JWB 335

Tutoring: The Math Department Tutoring Center, also called the *Math Center*, is located in the basement of building LCB. Free tutoring is offered Mon–Thu from 8 a.m. to 8 p.m., and from 8 a.m. to 6 p.m. on Friday. Some, but not all of the math tutors welcome questions from Math 2250 students. To see the times and specialities of various tutors, consult the web address

www.math.utah.edu/ugrad/tutoring.html.

Texts:

Differential Equations and Linear Algebra, by C.H. Edwards Jr. and David E. Penney, 2009 Third Edition (the required text, ISBN-10: 0-13-605425-0). New problems and text material appear in the third edition.

The *2008 Special Edition* at the UofU bookstore, called the *Fatbook*, binds the second edition and the student solution manual into one volume. This action traps the *answers* to selected exercises a few hundred pages inside, instead of at the end of the book, as you might expect. While this book can be used, there have been many edits.

Additionally, we will use several sections from a different Edwards-Penney text, the current 2280 textbook, to cover *electrical circuits* and extra *Laplace transform* material. Students who buy the new text from the bookstore will receive an **access code to download the**

¹Pronunciation: In the phrase Gust of Wind replace Wind by Sun.

supplementary material. Students who buy a used text may get copies of the sections needed by xeroxing the few pages necessary from the 2280 book, any edition [available in the Math Center and Math Library for checkout].

Student Solution Manual, for the Edwards and Penney text *Differential Equations and Linear Algebra*. This is supplied with the bookstore's *special edition*. The third edition has a separately purchased solution manual.

Differential Equations, Cliff's Notes series. Contains concise examples and readable explanations of topics found in the Edwards-Penney text.

Online sources for used textbooks. A web search discovered a story which documents a \$50 non-refundable shipping charge added on without notice and a 20% restocking fee [what's 20% of \$144?]. The total cost for the used book was \$25 more than a new book direct from Pearson Publishing.

Illegal copies. It is illegal to xerox a whole textbook. It is also illegal to download a PDF copy of a whole textbook.

WWW documents for 2250 at web site <http://www.math.utah.edu/~gustafso/>. All are pdf or text documents that can be printed from Mozilla Firefox, MS-windows iexplorer, OS/X Safari, Opera and other web browsers that support printing of text and pdf files. Author: G.B. Gustafson. The notes and slides may be freely viewed and printed. The typeset material is from a 900 page book on differential equations and linear algebra.

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. The co-requisite is Physics 2210 (Phy 301 before 1998), with actual use of physics minimal. There is use made in the course of partial derivatives, the Jacobian matrix and the chain rule in several variables.

To cooperate with the engineering programs on campus, some `maple` contact is required in the course work for 2250. All computer code examples are supplied in `maple` only.

If you want to use only `matlab`, then be aware that you must translate `maple` code examples to `matlab` code by yourself. Generally, this is a nontrivial exercise. Some help is available in `maple` itself, for automatic generation of `matlab` code from `maple` code. See `CodeGeneration[Maple]` in `maple help`.

A passive knowledge of `maple` is assumed. Persons without the passive knowledge of `maple` and `unix` may attend one of the 50-minute *tutorials* on the subject offered during the second and third weeks of the term. The instructor for these tutorials is selected by Angie Gardiner. The dates and times are published at the 2250 course site web address listed above.

Angie's web page is www.math.utah.edu/ugrad/tutoring.html. Her office is MC 155A in building LCB, next to the Math center, phone 801-585-9478, email gardiner@math.utah.edu .

Persons without computer training and no `maple` experience can survive through Chapter 2 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. Individual copies of `matlab` after 2008 may no longer have `maple` engines, but some other computer algebra system, instead.

Free tutoring is available in the LCB tutoring center 8:00 a.m. to 8:00 p.m. daily, except until 6:00pm on Friday, closed weekends and semester holidays. Some `maple` help is available. Only a few of the tutors are capable of helping you on computer projects or on 2250 homework problems. The work hours of those individuals can be found by calling the math center help desk.

Course material and requirements

This course is an introduction to linear algebra and differential equations in engineering and science. Chapters 1 to 10 in the Edwards-Penney text, supplementary materials from the Edward-Penney *Differential Equations and Boundary Value Problems* textbook (2280 book, any edition, sections 3.7 and 7.6) and class notes published as PDF [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. Past exams and solution keys appear at the course web site. You are expected to study past exams in detail.

Grading:

Final grades will be based on:

Textbook problems, the major part of the **dailies**, 128 scores. This includes two special exam review problems ER-1, ER-2, which are not in the textbook, but at the course web site.

Seven computer projects form the minor part of the **dailies**. Each project is counted like several textbook problems, for a total of 24 scores, making $128+24=152$ dailies.

Three written midterm examinations. They are given during the TA sessions. Each midterm is five (5) problems. The first (3) three problems are given on one date and the last two (2) problems the next date. This course (2250-1) meets 5 days a week.

Final exam. This University-scheduled in-class 2-hour examination counts as two additional midterm scores.

Written In-Class Exams:

There are three (3) midterm exams. There is a 2-hour in-class final exam as scheduled by the university. The midterm and final exams are graded by G.B. Gustafson and the Thursday graduate assistant lecturer. These exams are scheduled for Thursday Lab time 7:25am or 8:30am. There are no additional exam times. Please notify me **in advance of the exam date**, that you will miss the exam. If that is not possible, then notify me anyway. Email is best, ggustaf@math.utah.edu . Phone 801-581-6879 (my office) or 801-581-6851 (math office) works too. Please know that once you miss the exam, the crisis has ended, and recovery is the next plan. Please respond ASAP.

Hand-written Dailies:

There will be 152 dailies due during the semester, including textbook problems and seven maple labs. They will be graded by a staff of readers employed by Angie Gardiner.

Records:

Accounting of exams and the dailies is initially on paper. By the end of the semester there are usually 100 sheets of double-sided paper records.

Ultimately the paper records are turned into spreadsheet records. The spreadsheet records are web-posted at the Registrar's web site, the site where you register for classes and pay tuition. After login, connect to the link for **webCT**. Your grades will be posted and periodically updated, even beyond the end of the semester.

If you ask for record information before it is electronic, and web-posted, then the request involves 20-30 minutes of your time, to retrieve it from paper records. This is in general a waste of time, and I will refuse the service, if it is only to find a few missing dailies. **Please keep your own records**. Correction of records, when required, can be made by email communication, even after the course ends.

Homework, computer labs, midterms and final

Submission and Return of Dailies

Textbook problems, maple labs and extra credit problems (called *dailies*) will be submitted in class. The return of the large volume of written work is problematic, because no one has the time in class to search through a giant stack of paper.

Work is accepted as a stapled package with your name on the top sheet in the upper right corner, the time of your class just below your name, followed by the **group** stack, which is a sublist of the students, obtained by dividing the alphabet into up to 2 subsets, like A-J, K-Z. The actual division depends on the class size and distribution of names.

Work is returned in class in stacks, one stack for each group. One attempt will be made to return a stack. Then the stack goes in a box outside 113 JWB, and you will have to retrieve your work with a separate trip.

Textbook problems

The problems to be submitted for grading are listed at the end of the syllabus and also on the **grade sheet** for the course. Each problem has a tentative due date. A duplicate of this information appears on the **due dates page** at the course web site. Visit the web site for extra copies of the syllabus and grade sheet.

The actual due dates for problems appear only on due dates page at the course web site. They are dynamically updated to reflect the reality of what was discussed in class. Ideally, problems are submitted shortly after class discussion.

Students are asked to complete each textbook problem and submit their work in their own handwriting. Collaboration is permitted and encouraged on textbook problems in teams of 2 and study groups of a larger size. Submit a separate handwritten report for each partner.

Homework problems are written as several problems per package with your name, class time on each sheet, and a problem label for each problem. **Please write your class time 7:30 on your paper, next to your name, and insert a problem label.** Problem labels look like 1.2-5, for problem 5 in section 1.2 of Edwards-Penney. Page numbers: please do not cite or label a problem by page number only. Citation for the supplementary material can look like EPbvp 7.6-4. For extra credit problems, use a label like Xc1.4-5.

Graders try to write the scores on the top page. This plan speeds up return of the work, so please use stapled packaging. No stapler? Just deposit your work in a stack without the staple.

There are certain **expectations** 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 a pdf document *format for submitted work*. Please apply the ideas found there to your written work.

Computer projects

There will be seven computer projects assigned during the semester, related to the classroom material. Each project counts the same as 3 to 4 daily problems from the textbook, for a total of 24 scores on the dailies. They will be written by hand and use the software package **maple**.

Maple labs are submitted in a stapled package containing all requested parts.

There is a Math Department Computer Lab in building LCB at which registered students automatically own accounts, and 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 tty sessions on math hosts using command `ssh user@xserver.math.utah.edu`. To operate in X-windows, replace ssh by ssh -X or ssh -X -Y. 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.

There is *free* tutoring support for these projects (graduate assistant lecturers) and for your other course work as well. Drop-in tutoring in the *Math Center* (glass doors to the computer lab) 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 2250 questions.

Midterm exam details

The exams are modeled after old exams. Available on the web page are old exams and solution keys, including all midterm and final exams for the last three years. You may print these for reference. The final exam has a separate study guide, also available at the site.

Books, tables, notes, cell phones, ipods, earphones and calculators are not allowed on exam day.

An in-class Midterm exam has different presentation rules, and none of the textbook problem suggestions apply in this case. Basically, the in-class exam is a first draft. No answer checks are expected. Answers count 25% and details count 75%.

Final exam details

Two hours are reserved for this written exam. As published by the university:

7:30 class Fri 27 April, 2012 from 8:00am to 10am [JTB 140]

The final exam is comprehensive. It covers explicitly chapters 3, 4, 5, 6, 7, 8, 9 and 10 with weight distributed evenly across the chapters listed. A study guide consisting of problem types by chapter plus several final exam solution keys for previous final exams appear at the web site. There is implicit contact on the final exam with chapter 1 and 2 topics, but there are no matching problems [see a previous semester's final exam key].

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

Due dates are updated dynamically at a link on page

<http://www.math.utah.edu/~gustafso/s2012/2250/index2250S2012.html>.

Browse this site often. To repeat: **the due dates are not given in class!** Email communication will be made for due date changes and upcoming exams. The registrar's list is used for communication.

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. This adjustment is needed for snow days and unforeseen events, so it happens infrequently.

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 and therefore unacceptable when the stack of papers exits 113 JWB and goes to the grader. Papers not in the stack get a zero recorded for the assignment.

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 of 50% or 0. While a zero generally means no work was submitted, graders sometimes reject a paper completely and mark it zero, as though nothing was submitted. You'll get the paper back and maybe an explanation of why they did that.

The state of submitted work is locked at the point the grader gets the stack. A grader's job is to filter out the good work from the bad work and record the result. This record is never appended, it is only corrected for errors.

The lowest seven (7) 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. Extra credit problems have different rules but they are counted like dailies.

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 and options for completing the work.

Extra credit

Extra credit problems are only available in PDF format at the course web site. They do not appear in the textbook, in this syllabus or on the grade sheet. 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 printed on the due dates page at the web site. Tentative dates for collection are once for Ch1 to Ch6 and once for Ch7 to Ch10. You may submit extra credit work early, but most people wait for the deadline.

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 801-581-6879), which is to say, accommodation shall be made.

Policies on Dailies and Exams

Policy on Dailies: The highest 146 dailies will be counted. The lowest 7 of the 153 dailies will be dropped. Any record with less than 60 dailies 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 sent to the assistant earns a grade of zero. Extra credit exercises can correct these zeros.

Policy on Exams: The final exam is doubled before determining the exam average, to count like two midterms. The effect can be imagined as five midterm scores, averaged to obtain the semester exam score average.

Policy on Rank-in-Class: The class ranking is determined only by the exams. Rank 1 is the best, determined by sorting on the exam average $(mid1+mid2+mid3+final+final)/5$. There is no influence on class standing from dailies.

Dailies and Letter Grade: The dailies affect only the final letter grade assigned. A grade of *E* is assigned for less than 60 dailies. Otherwise, dailies contribute 30% towards the letter grade. In extreme cases, the influence is \pm one letter grade, e.g., *B-* on exams changes from *C-* to *A-*.

Grading Scale: The internally-used 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:

$$\begin{aligned} A &= 95-100, A^- = 90-94, B^+ = 85-89, B = 80-84, \\ B^- &= 75-79, C^+ = 70-74, C = 65-69, C^- = 60-64, \\ D^+ &= 55-59, D = 50-54, D^- = 45-49, E = 0-44. \end{aligned}$$

Final grade

A grade of *E* is assigned if the Dailies score sums to less than 6000, which is 60 dailies, 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 153 textbook problems and maple labs is 91% and the Exam Average of the three 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 153 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.

Engineering School Expectations

Mechanical, electrical and chemical engineering departments expect stellar performance in differential equations and linear algebra. They have asked for homework to be collected and graded. All of it, not some minimal portion of the total homework.

The various engineering and science departments served by 2250 decide the list of topics to be taught, not the math department.

Graduation requirements of a C- or better in required math courses seem to be counter to departmental requests. Be advised that a grade of C- is viewed these days as a failure by all graduate schools and employers.

How dailies are graded

Graders assign scores on dailies as one of 100, 50 or 0. Based on grading history, about 90% of the scores on a given problem are 100%. A score of 0 is routinely given for work not submitted.

A grade of 100 usually means a complete, correct solution was written. Graders are asked to be generous, and give a 100 score 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 to multiple errors canceling the logic error.

A grade of 50 means the written work lacked essential details. This score is often given for a written solution with just the answer and a few sketchy details. Examples of sketchy solutions, worth 50 or 0 for a score, appear in the textbook's solution manual. The naive assumption that the textbook's authors have supplied a solution to the problem in the manual is simply false: it is a solution sketch, by design devoid of essential details.

The wrong answer is a reason for the grader to look for a flaw. Because all written solutions must have an answer check, a wrong answer signals a careless report. The graders have license to be kind, or to be unkind.

Extra credit problems

Extra credit problems are only available in PDF format at the course web site. They do not appear in the textbook, in this syllabus or on the grade sheet. It is possible, because of them, to earn 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.

Which problems should I work? You can choose whichever extra credit problems that you want, to replace scores of 50 or 0, within a given chapter. Just because you missed 1.2-2 is no reason to work Xc1.2-2. Instead, choose a problem from the extra credit problems for chapter 1 that can extend your knowledge or help you to prepare for exams. My advice is to beat on problems you missed, because missing a problem is usually a wake-up call. If it was just a silly mistake, like miscopying the problem statement, then choose a different problem.

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

Problem Count	Score	
9	100	successful dailies
3	50	dailies with demerits
3	0	failed dailies
4	100	extra credit, success

Then the average on chapter one is the smaller of $(9 * 100 + 3 * 50 + 4 * 100)/15 = 96.67$ and 100. The fifth extra credit problem could add 100 to the total, 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. An exception to this rule is end-of-semester extra credit problems, which apply to increase the dailies average up to a maximum of 100%. Generally, this offer applies only to a few dailies which were skipped by decree (e.g., 9.4, two problems), and to chapter 7 [systems], chapter 8 [matrix exponential], chapter 9 [dynamical systems], chapter 10 [Laplace] and chapter 10X [challenging Laplace] extra credit problems, which add credit across all chapters.

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, usually devoid of proofs. 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, often with the aid of computer slides, which are mirrored at the web site as PDF files. Slides cover a similar problem or sometimes the exact problem considered in the project.
- **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 engineering mathematics book. 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 1990–2011. This format is described in some detail below and also in the internet document *format for submitted work*.

Suggestions for Improving Written Work

1. Use engineering paper or plain white paper. Lined notebook paper and graph paper are not acceptable 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.** For problems without a textbook answer, a full answer check is expected.
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. Items 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 Math Center LCB, teaching assistants and fellow students.

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

Presentation is expected to improve throughout the 15 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 algebra and calculus. 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.

Extra credit instructions

Extra credit problems for chapters 1 to 6 add credit to the chapter in which they appear. They do not add credit to any other chapter. The policy changes for Chapters 7, 8, 9, 10 extra credit, and Chapter 10X extra credit, which add credit to any and all chapters. 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 grade sheet. Extra credit problems could potentially add 5 times 100 or 500. If 1350 was earned on standard problems and maple labs, plus 300 on extra credit, then the total earned is $(1350 + 300)/16 = 103.125$. 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/index2250.html> has a link to PDF files for all extra credit problems, one PDF file for each chapter. They do not appear in the textbook. They are **not** listed in the syllabus nor on the grade sheet.

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 and class time.

Deadline. The deadline for submitting extra credit is approximately the due date for the last problem of the next chapter. The extra credit stack is delivered on that date to a grader. The records are locked by the grader and never appended, only corrected.

The exact date for submission of extra credit work is set at the web site due date page. This is done to give extra time, when available, due to busy grader schedules. Please check the due dates page often, especially before preparing work to be submitted.

Which problems should I work? You can choose whichever extra credit problems that you want, to replace scores of 50 or 0, within a given chapter.

How do I get credit for a missed maple lab? You can get credits for maple labs by doing a maple extra credit lab, or math-only extra credit problems. Check that the maple lab appears in the extra credit problem file, then choose *any problem* from that chapter of extra credit exercises.

Week 1, Jan 9 to 13. Lecture 1.1, 1.2, 1.3, 1.4.

09 Jan, Intro, GB Gustafson, nothing due.
10 Jan, Nothing due.
11 Jan, Submit Page 16, 1.2-2 for quick review.
12 Jan, Intro, Thu. assistants
13 Jan, Begin maple lab 1.

Week 2, Jan 16 to 20. Lecture 1.5, 2.1, 2.2.

16 Jan, No class, Martin Luther King
19 Jan, LCB115: Time TBA, First maple intro lecture.
19 Jan, Thu TA: Quadratics and maple lab 1.
Exam 1 review. Drill, Q&A ch1.
Homework package week 2, 6 problems
20 Jan, Page 17, 1.2: 2, 4, 6, 10
20 Jan, Page 27, 1.3: 8, 14
20 Jan, LCB115: Time TBA, Repeat maple intro lecture.

Week 3, Jan 23 to 27. Lecture 2.3, 2.4, 2.5, 2.6.

24 Jan, LCB115: Time TBA. Repeat maple intro.
26 Jan, Thu TA: Discuss maple L2.1. Exam 1 review. Drill, Q&A ch1.
Homework package week 3, 9 problems
27 Jan, Page 43, 1.4: 6, 12, 18, 22, 26
27 Jan, Page 56, 1.5: 8, 18, 20, 34

Week 4, Jan 30 to Feb 3. Lecture 3.1, 3.2, 3.3.

01 Feb, Thu TA Exam 1 review. Discuss maple L2.
Homework package week 4, 6 problems
03 Feb, Page 87, 2.1: 8, 16
03 Feb, Page 98, 2.2: 10, 14
03 Feb, Page 108, 2.3: 10, 20

Chapter 1 and 2 Review Problems [Do not submit].
Page 17, 1.2: 29,35,41; Page 27, 1.3: 10,25,26,33;
Page 43: 1.4-51,59; Page 56: 1.5-21,23,33,39;
Page 78: 1, 2, 5, 6, 7, 10, 13, 15, 19, 20, 21,
24, 25, 28. Solve one way: 31, 32, 36;
Page 87: 2.1-4,22,32,37; Page 98: 2.2-7,8,15,17;
Page 108: 9,19,24; Page 121: 2.4-5,17;
Page 132: 2.5-5; Page 142: 2.6-5,29.

Week 5, Feb 6 to 10. Lecture 3.4, 3.5, 3.6.

06 Feb, Submit Exam Review problems ER-1, ER-2 [web site]
06 Feb, Submit maple L2.1 copy for quick feedback [not graded].
07 Feb, Submit Maple lab 1: L1.1, L1.2, L1.3, L1.4
09 Feb, Thu TA: Exam 1 review. Discuss maple Lab 2.
Homework package week 5, 8 problems
12 Feb, Page 155, 3.1: 6, 16, 26
12 Feb, Page 165, 3.2: 10, 14, 24
12 Feb, Page 174, 3.3: 10, 20

Week 6, Feb 13 to 17. Lecture 4.1, 4.2, 4.3, 4.4.

16 Feb, Midterm 1, Part 1, Three of Five problems ch1 and ch2
Homework package week 6, 7 problems
17 Feb, Page 186, 3.4: 20, 30, 34, 40
17 Feb, Page 199, 3.5: 16, 26, 44

Week 7, Feb 20 to 24. Lecture 4.4, 4.5, 4.6, 4.7.

20 Feb, No class, President's Day
23 Feb, Midterm 1, Part 2, Last Two of Five problems ch1 and ch2
Homework package week 7, 11 problems
24 Feb, Page 216, 3.6: 6, 20, 32, 40, 60
24 Feb, Page 237, 4.1: 16, 20, 32
24 Feb, Page 244, 4.2: 4, 18, 28

Week 8, Feb 27 to Mar 2. Lecture 5.1, 5.2, 5.3, 5.4.

29 Feb, Submit maple lab 2: L2.1, L2.2, L2.3, L2.4
01 Mar, Thu TA: Exam 2 review. Discuss numerical maple L3, L4.
Homework package week 8, 4 problems
02 Mar, Page 252, 4.3: 18, 24
02 Mar, Page 259, 4.4: 6, 24

Week 9, Mar 5 to 9. Lecture 10.1, 10.2, 10.3, 10.4

Homework package week 9, 7 problems
07 Mar, Page 268, 4.5: 6, 24, 28
07 Mar, Page 276, 4.6: 2
07 Mar, Page 284, 4.7: 10, 20, 26
08 Mar, Thu TA: Exam 2 review. Discuss maple L3, L4.
09 Mar, Nothing due.

Chapter 3 and 4 Review Problems [Do not submit].
Page 155: 3.1-7,9,17,27; Page 165: 3.2-9,15,21,25;
Page 174: 3.3-11,19,35; Page 186: 3.4-11,13,21,33,35,39;
Page 199: 3.5-17,25,33,43; Page 216: 3.6-5,11,17,29,37,51,53;
Page 237: 4.1-23,27,33-36; Page 244: 4.2-3,7,11,17,21,27,29;
Page 252: 4.3-11,17,25; Page 259: 4.4-5,21,31;
Page 268: 4.5-9,15,19,23; Page 276: 4.6-3,5; Page 284: 7,11,19,25;

Spring Break: Mar 12-16. Happy Holiday!

12-16 Mar, Traveling? Nothing due from Mar 8-18. Substantial amounts of dailies, including maple projects, are due after the break.

Week 10, Mar 19 to 23. Lecture 10.5, EPbvp7.6, 5.5

22 Mar, Midterm 2, First Three of Five problems ch3, ch4, ch5.1-5.3
Homework package week 10, 15 problems
23 Mar, Page 299, 5.1: 34, 36, 38, 40, 42, 46, 48 [done in 20 min]
23 Mar, Page 311, 5.2: 18, 22
23 Mar, Page 323, 5.3: 8, 10, 16, 32
23 Mar, Page 335, 5.4: 20, 34

Week 11, Mar 26 to 30. Lecture 5.6, EPbvp3.7, 6.1, 6.2

27 Mar, Submit numerical maple L3: L3.1, L3.2, L3.3
27 Mar, Submit numerical maple L4: L4.1, L4.2, L4.3
29 Mar, Midterm 2, Last Two of Five problems ch3, ch4, ch5.1-5.3
Homework package week 11, 11 problems
30 Mar, Page 585, 10.1: 18, 28
30 Mar, Page 598, 10.2: 10, 16, 24
30 Mar, Page 608, 10.3: 6, 18
30 Mar, Page 617, 10.4: 22
30 Mar, Page 625, 10.5: 4, 22, 28

Week 12, Apr 2 to 6. Lecture 7.1, 7.2, 7.3, 7.4.

05 Apr, Thu TA: Exam 3 review. Discuss maple labs L5, L6.
Homework package week 12, 12 problems
06 Apr, Page 351, 5.5: 54, 58, 6, 12, 22
06 Apr, Page 362, 5.6: 4, 8, 18
06 Apr, Page 510 in EPbvp 7.6: 8, 22
06 Apr, Page 227 in EPbvp 3.7: 4, 12

Chapter 5 and 10 Review Problems [Do not submit].
Page 299, 5.1: 33,35,37,39,41,43,53; Page 311, 5.2: 19,23;
Page 323, 5.3: 7,9,17,31,37; Page 335, 5.4: 11,17,19,33;
Page 351, 5.5: 5,11,19,25,27,39,47,51,59; Page 362, 5.6: 3,9,15;
Page 585, 10.1: 9,11,13,15,17,27,29,31,40;
Page 598, 10.2: 7,9,15,17,19,21,23,35,37;
Page 608, 10.3: 3,5,7,9,11,13,15,17,21,29,31,35;
Page 617, 10.4: 3,9,13,17,23,27,29,37;
Page 625, 10.5: 3,9,13,21,25,27,29,33,37;
Supplements EPbvp Review Problems [Do not submit].
7.6 and 3.7: Solve 4 more problems from each.

Week 13, Apr 9 to 13. Lecture 7.4, 7.5 /w Laplace, 8.1, 8.2.

10 Apr, Submit linear algebra maple lab5: L5.1, L5.2, L5.3
10 Apr, Submit differential equations maple lab6: L6.1, L6.2, L6.3
12 Apr, Midterm 3, First two of Five problems ch5, ch10, ch6
Homework package week 13, 7 problems
13 Apr, Page 374, 6.1: 12, 20, 32, 36
13 Apr, Page 379, 6.2: 6, 18, 28
13 Apr, All Semester extra credit chapters 1,2,3,4,5,6 due. No extension.

Week 14, Apr 16 to 20. Lecture 9.1, 9.2, 9.3.

17 Apr, Submit maple lab7: L7.1, L7.2, L7.3, L7.4, L7.5
19 Apr, Midterm 3, Last Three of Five problems ch5, ch10, ch6
Homework package week 14, 9 problems
20 Apr, Page 404, 7.1: 8, 20
20 Apr, Page 417, 7.2: 12, 14
20 Apr, Page 429, 7.3: 8, 20, 30
20 Apr, Page 438, 7.4: 6, 24

Chapter 6 and 7 Review Problems [Do not submit].
Page 374, 6.1: 3,7,11,15,19,21,23,29,33,35,39;
Page 383, 6.2: 5,7,9,13,15,19,23,25,27,29,31,33,37;
Page 404, 7.1: 7,11,15,17,24,26; Page 417, 7.2: 3,7,13,23;
Page 429, 7.3: 7,11,21,29,31,39,43,45,49;
Page 442, 7.4: 3,9,13,17,21;

21 Apr, Saturday: Special Final Exam review, 2pm, LCB 219

Week 15, Apr 23,24,25. Lecture 9.4, Final Review.

Homework package week 15, 14 problems
25 Apr, Page 492, 8.1: 4, 12, 38
25 Apr, Page 502, 8.2: 4, 19
25 Apr, Page 527, 9.1: 4, 8, 18
25 Apr, Page 541, 9.2: 2, 12, 22
25 Apr, Page 554, 9.3: 8, 9, 10

Chapter 8 and 9 Review Problems [Do not submit].

Chapter 8: 8.1-3,11,35; 8.2-3,15,21;
Chapter 9: 9.1-3,7,17; 9.2-5,7,9,13,17,19,23,29;
9.3-7,8,11; 9.4-1,3,13;

25 Apr, Office hours and lectures finished.
When counting submitted work, account for ER-1,2 [2], Maple [25],
Homework Packages week 2-15 [126]. If you missed anything, then
submit Extra Credit from the 30 April package below.
27 Apr, Final Exam at 8am until 10am in JTB 140
See the online final exam study guide.
30 Apr, Semester Extra Credit due under the door 113JWB by 6pm.
Page 570, 9.4: 4, 8
Xcredit Ch7, Ch8, Ch9, Ch10, Ch10X
Xcredit maple 8,9,10.
Deliver under the door 113jwb by 6pm.
Extra credit Ch1 to Ch6 finished on 13 April. Work not submitted by
that deadline has no grader, and it won't be graded.

End of Semester Deadlines

Exam Period, 27 Apr to 4 May. Final exam for the 7:30am class is Fri April 27, 2012 at 8am.

Extra Credit: Under the door, 113jwb.

30 Apr, Ch9, 9.4: 4, 8. Two problems.

30 Apr, Ch7 Extra Credit. About 9 problems on the ch7 extra credit page.

30 Apr, Ch8 Extra Credit. About 5 problems on the ch8 extra credit page.

30 Apr, Ch9 Extra Credit. About 11 problems on the ch9 extra credit page.

30 Apr, Ch10X Extra Credit. At least 10 challenging Laplace problems appear on the ch10X extra credit page.

30 Apr, Maple Optional Lab 8: Earthquake L8.1, L8.2, L8.3, L8.4, L8.5

30 Apr, Maple Optional Lab 9: Tacoma Narrows L9.1, L9.2

30 Apr, Maple Optional Lab 10: Brine/Glucose L10.1, L10.2, L10.3, L10.4

Extra credit records locked at 6pm on 30 Apr. Ch7, Ch8, Ch9, Ch10X and maple 8,9,10 credits apply to the semester dailies total.