Draft of January 14, 2019
Math 2373, CSE Linear Algebra and Differential Equations, Spring 2019
University of Minnesota, Twin Cities Campus

(58914) Lecture 010: 11:15am-12:05pm, MW, Anderson Hall 370 (01/22/2019 - 05/06/2019)
(58918) Lecture 020: 2:30pm-3:20pm, MW, Anderson Hall 370 (01/22/2019 - 05/06/2019)

LECTURER and COURSE SUPERVISOR:

Prof. Greg W. Anderson: VinH 460, gwanders@umn.edu, (612) 625-9524
Office Hours: M: 3:45–5:00pm, W: 3:45–5:00pm, Th: 2:30-3:20pm
WEB PAGE: www.math.umn.edu/~gwanders/Math2373

ANNOUNCEMENTS: All announcements related to the class and classwork are made in lecture and are not necessarily posted on any website. All announcements about office hours, office locations, e-mail addresses of teaching staff, exam locations, etc. are made in recitation and are not necessarily posted on any website.

REQUIRED TEXT: Differential Equations & Linear Algebra, Second Edition by Farlow, Hall, McDill, and West. A used copy is okay provided it is the second edition. Also the Custom Edition used in 2017-18 is okay.

EXAM PROCTORING SCHEDULE: (This is a bit complicated. Read carefully.)

Students in discussions 11, 12, 13, 14, 15, 21, and 22 take exams in Willey Hall 175 at the times indicated (two choices):

Midterm I: Tues., Feb. 19, 2019 (5:00-5:55pm or 6:05-7:00pm)
Midterm II: Tues., Mar. 26, 2019 (5:00-5:55pm or 6:05-7:00pm)
Midterm III: Tues., Apr. 23, 2019 (5:00-5:55pm or 6:05-7:00pm)

Students in discussions 23, 24, and 25 take the exams on the same dates indicated above but do so in LindH40 at their regularly scheduled lab time.

Note: Labs 11, 12, 13, 14, 15, 21, and 22 do not meet on exam days but all recitations for the whole course DO meet on exam days.

Final Exam: Thurs., May 9, 2019, noon-3pm.
The exam sites will be announced toward the end of the semester in recitation. Stay tuned.

STATUTE OF LIMITATIONS: Requests for regrading of written work (midterm exams, homework, and lab reports) will be honored only for a period of one week after the items in question have been returned to the class. Failure to pick up an item when it is returned to the class does not stop the clock on the statute of limitations unless there is a written excuse for the absence.

CALCULATORS: On exams, any calculator is permitted, but we draw the line at laptops and touch-screen devices—these are forbidden. All other devices, especially those with wireless capabilities, must be turned off and stowed out of easy reach during exams. You may not have notes stored on your calculator or use it to communicate surreptitiously with others. You are required to have a graphing calculator capable of evaluating determinants and finding the reduced row echelon form of a matrix.

SPECIAL NEEDS: Please inform us of any accommodations granted through the Disability Resource Center (DRC) within the first two weeks of class. More specifically, please present a copy of your accommodation letter to your lecturer in the first two weeks and set up your accommodations for the whole semester. For further information on these issues please visit:

https://diversity.umn.edu/disability/syllabusstatement
S/N GRADE: If you are registered S/N we will submit a grade of S if your letter grade is C- or above, and otherwise a grade of N.

MAKE-UPS (for one-time extraordinary events) Exam absences due to recognized University-related activities, religious holidays, verifiable illness, and family/medical emergencies will be dealt with on an individual basis. For university activities or religious holidays you should make arrangements with your TA and Prof. Anderson well in advance. If you are suddenly unable to take an exam, you should e-mail your TA with cc to Prof. Anderson ASAP. **If you are too sick to take an exam, do not take the exam because there are no retakes.** In all cases of absence from exams a written excuse is required for a make-up to be granted. Ignorance of the time and place of an exam will not be accepted as an excuse for absence from an exam. If you do not take an exam you will be assigned a score of zero for that exam.

INCOMPLETES: We will consider giving you an incomplete only if some severe, unexpected event prevents you from completing the course AND you have taken at least 2 midterms AND to date you have been doing work at the C level or better. In order for us to grant an incomplete, you will have to sign a contract stating exactly what you must do to complete the course. We do not grant incompletes just because you’ve gotten behind in your work. You may drop without permission from any class up through the 8th week of the semester.

MAKE-UPS: (for recurring conflicts with classes or work) If you have a class to attend, or a job to hold down every Tuesday evening during the semester, or a similar recurring conflict, you must inform your TA in person during the third week of the semester. (We’ll remind you about this in recitation in the third week.) You must supply written documentation, e.g. a print-out of your class schedule, or a signed note from your supervisor at work. You will then take the exam on the next day, Wednesday, during the day. The times and places available for this make-up exam will be announced in recitation. Stay tuned. Students taking the Wednesday make-up without previously clearing it with their TA will receive a score of zero on that exam.

PROCEDURE FOR CALCULATING GRADES IN MATH 2373

Students collect points during the semester as follows:

- There are 12 homework assignments each of 10 points maximum.
- There are 9 lab reports each of 10 points maximum.
- There are three midterm exams each of 100 points maximum.
- There is a final exam of 200 points maximum.

Your **Total Exam Score** is calculated by the formula

\[
\frac{(MT1 + MT2 + MT3) \times 450}{300} + \text{FINAL} \times \frac{350}{200}
\]

which is 800 points maximum. Your **Total Score** is calculated by the formula

\[
\frac{\text{HmwkTotal} \times 100}{120} + \frac{\text{LabTotal} \times 100}{90} + \frac{(MT1 + MT2 + MT3) \times 450}{300} + \text{FINAL} \times \frac{350}{200}
\]

which is 1000 points maximum. The distribution of course grades in each recitation will be determined by the performance of the students on the common midterm and final exams as measured by the **Total Exam Score**. An individual student’s course grade within that distribution will then be determined by the **Total Score**. We use this procedure so that your lab and homework performance is compared only with that of other students in your recitation.
MIDTERMS: There are three midterm exams, each 55 minutes long and given on a Tuesday evening. The ground rules are closed book, closed notes, open calculator and no “cheat sheets” other than those we may provide attached to the exam. There are no multiple choice questions. Questions are similar to homework and worksheet problems but are never verbatim quotes. Students who elect to take the exam starting at 5pm must stay in the exam room in their seats until time is called to end the exam. Students who elect to take the exam in the second session after 6 may leave when they are finished with the exam. Scientific and graphing calculators are allowed on exams, but laptops, cell-phones, audio devices, etc are not allowed. You may not have notes stored in your calculator or use it to communicate surreptitiously with others. In the absence of specific instructions to the contrary, you are expected to show all the work needed to justify your answers by hand (rather than machine) calculation. Answers appearing without supporting calculations and explanation, even correct ones, will receive no credit. Please use the results of the first midterm to help you decide if you’re in danger of failing and should either drop the course or get extra help.

HOMEWORK: Homework is assigned once a week and is due on Tuesdays in recitation at the *beginning* of the class period. No credit for late homework. We encourage you to discuss homework problems with your classmates, including strategies for solving different kinds of problems. Indeed this is one of the best ways to improve your understanding of the course. However, when you write up your solutions you must do this on your own. Handing in homework that is almost identical to a classmate's is a form of cheating and will not be tolerated. Your homework must be neatly, clearly and logically written. **Hard copies are required.** Staple or clip your homework together. You are required to show methods of solution, not just final answers, and to explain yourself with reasonable clarity. You will lose homework points if you fail to meet any of these standards.

LABS: Each week you spend 50 minutes in the lab interacting with MATLAB and you are expected to produce a report on your laboratory activities, due at the *beginning* of lab the next week. No credit for late labs. We discourage verbatim transcription of all your interactions with the computer – that’s too much to read. We want just enough computer printout and additional commentary to answer all the questions on the lab handout and to convince us that you understood your assignment. All MATLAB commands you use should be included in the report but the intermediate output should be edited out. What you hand in should be a complete and neatly presented lab report written using sentences. **Hard copies are required.** Pages should be stapled or clipped. Handing in a lab report that is almost identical to a classmate’s is a form of cheating and will not be tolerated. You will lose lab points if you fail to meet any of these standards.

FINAL EXAM: The final exam is three hours long. The ground rules are the same as for the midterms: closed book, closed notes, open calculator, and no “cheat sheets” other than those we provide. Questions will be in the same format as on the midterms. In particular, there are no multiple choice questions and unless otherwise instructed you have to show all the work needed to solve problems by hand. Please note the date and time of the final exam very carefully and plan accordingly. You commit to that date and time, as well as the designated location to be announced later, when you sign up for the course. No exceptions.

See [http://www.policy.umn.edu/Policies/Education/](http://www.policy.umn.edu/Policies/Education/) for University GRADING STANDARDS and standards of SCHOLASTIC CONDUCT.

Finally: **STUDENTS ARE HELD RESPONSIBLE FOR ALL ANNOUNCEMENTS AND ALL COURSE CONTENT DELIVERED IN LECTURE AND IN RECITATION.** All official announcements occur in lecture and recitation. We will not make extraordinary efforts to contact students outside of lecture and recitation.
Math 2373, CSE Lin. Alg. and Diff. Eq., Spring 2019, Univ. of Minn.
HOMEWORK ASSIGNMENTS THROUGH WEEK 4 (stay tuned for further announcements)

All assignments are from the required text by Farlow, Hall, McDill and West (except for a few “home-made” problems written right on this sheet). Answers to all problems must be justified—unexplained numerical answers will get no credit. Calculations must be done by hand unless you are given specific instructions to do otherwise. Remember that you are practicing up for the exams.

Week 1 homework due Tuesday, Jan. 29
• Sec. 3.2, pp. 143–145: 5, 6, 8, 12, 13, 14, 16, 19, 21, 22, 26, 30, 33, 34
• Use the row operation notation on p. 134 of the text correctly to explain each step of row-reduction needed to reduce the matrices in problems 12, 13, 14, 16, 19, 21, 22 to reduced row echelon form. In 33, 34 we give you a pass to use the \texttt{rref} command on your calculator, but other than that all work must be done by hand. Furthermore, in answering 26, 30, 33, 34 don’t just discuss solutions—find all of them. In the case of more than one solution give the answer in the form demonstrated in Ex. 7 on pp. 139–140.

Week 2 homework due Tuesday, Feb. 5
• Sec. 3.1, pp. 127–130: 2, 3, 4, 5, 6, 7, 12, 14, 18, 22
• Sec. 3.2, pp. 143–145: 1, 2, 4, 66 (To do 66 you may use your calculator to calculate \texttt{rref} but then in case of infinitely many solutions you must write out the solution following Ex. 7 on pp. 139–140.)
• Sec. 3.4, pp. 164–167: 1, 2, 3, 4, 12, 13, 16, 17, 18, 39, 42 (When/if using row operations, use the notation from p. 134 of the text. In 39 and 42, write out the determinants carefully but then you can evaluate them with your calculator.)
• Problem 15 from Sec. 3.4 is not assigned but you must know what it says to do 16, 17, 18.
• Sec. 2.2, pp. 70–73: 1, 2, 6, 8, 16, 18 (We use only the integrating factor method to solve first order linear differential equations in this course.)

Week 3 homework due Tuesday, Feb. 12
• Sec. 3.3, pp. 154–156: 1, 2, 6, 7, 8, 13, 20, 21. (Problems 6, 7, 8, 13 must be done by hand with row operation notation. Problems 20 and 21 use the important formula $x = A^{-1}b$ which needless to say you must know.)
• Sec. 3.3: 15 is not assigned but it is awfully handy and you must know it!
• Sec. 1.1 (No homework is assigned from this section. But you should know the vocabulary in boxed examples 2 and 3, and know names of the differential equations in boxed examples 4–8.)
• Sec. 1.2, pp. 20–24: 2, 3, 13, 14, 16–21,
• Sec. 1.3, pp. 29–32: 11, 14, 18, 25–30, 32, 34

Week 4 homework due Tuesday, Feb. 19
• Sec. 3.4, pp. 164–167: 46, 50
• The method of 50 also makes quick work of 46.
• Sec. 2.1, pp. 62–63: 1, 2, 3, 4, 8, 10 (give reasons)
• Sec. 2.2, pp. 70–73: 16, 18, 23, 29
• Sec. 3.3, pp. 77–80: 4, 5, 6, 9, 17, 31
• Sec. 2.4, pp. 84–87: 2(a,c), 3(a,c), 6, 16, 18
• Your answers to the questions in Secs. 2.3 and 2.4 will require a few words (or pictures) of explanation over and above the calculations. (Note that mathematically problem 31 of Sec. 2.3 and problems 2 and 3 of Sec. 2.4 are pretty much the same.)
• Home-made: An enormous tank initially contains 400 gallons of water in which is dissolved 50 lbs of salt. Brine containing 4 lbs of salt per gallon enters the tank at the rate of 5 gallons per minute. The well mixed brine leaves the tank at the slower rate of 3 gallons per minute. Find an expression for the number of pounds of salt in the tank at time $t$. 