Math 21-259, Sections 1 and 2
Differential and Integral Calculus
Course Information – Winter 2009

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Text: *Essential Calculus: Early Transcendentals* by James Stewart.

Web Sites: `http://www.math.cmu.edu/~amanita/math259`

`http://www.stewartcalculus.com/media/6_home.php`

Calculator: A graphing calculator will be a useful thing to have. Most of the calculator handouts will be based on the TI-83/TI-83 Plus/TI-84/TI-84 Plus family of calculators. Many students like the TI-86 and TI-89 calculators because of their advanced capabilities. If you select a more advanced calculator, make sure you are very familiar with it and keep the user manual handy. You will be allowed to use your calculator on quizzes and exams although some quiz and test questions will explicitly forbid the use of calculators.

Important Dates:

Add/Drop deadline (Tuition)	Friday, January 23.
Last day to drop (no W)	Monday, March 30.
Last day to drop (W)	Friday, May 1.
Unit exam 1	Friday, February 13, in class.
Unit exam 2	Friday, March 20, in class.
Unit exam 3	Friday, April 24, in class.
Final exam (cumulative)	Scheduled by registrar.

These exam dates are firm. Non-university related travel plans are not a sufficient reason to reschedule an exam.

Class Attendance:

We will cover the material at a rapid pace – probably considerably faster than you are used to if your last calculus course was in high school. I have been teaching college classes for more than 15 years and one of the strongest factors that I have seen in determining who passes and who fails each class is class attendance patterns. The material is covered so quickly that missing a week of class is almost certainly going to influence your learning of the material and performance in the course.

I don't have a formal attendance policy, nor do I have a formal component of the course grade devoted to class attendance. On the other hand, I am not afraid to assign final grades of "C," "D" or "R" either. The overwhelming majority of students who stopped coming to classes that I taught in the past ended up with a final grade that was a lot lower than they were hoping to get (and a lot lower than they had the potential to get).

Grading:

The main forms of assessment used in the course will be as follows:

Quizzes	10%
Homework	10%
Unit exam 1	20%
Unit exam 2	20%
Unit exam 3	20%
Final Exam (cumulative)	20%

The curve that I will use to determine your final grade is as follows:

Score Range	**Letter Grade**
90-100	A
80-89	B
70-79	C
60-69	D
0-59	R

The only circumstances under which I will deviate from this curve are to ensure that: (a) at least 20% of the class gets a final grade in the course of "A," and (b) at least 50% of the class gets a final grade in the course of "B" or higher. That is, the grade cut-offs listed above may be lowered at the end of the semester. They will not be raised, so for example, if you achieve a weighted average of 90 for the semester, you are guaranteed to get an A no matter what.

In the case of a non-integer, weighted average, your average will be rounded up to the nearest whole number.

Unit Exams:

Approximately once every four weeks we will have a major exam. The material covered on each of these exams will correspond roughly to one or two of the major mathematical areas that we will have covered.

Unit Exam 1: **Friday, February 13, 2008.**
Held during class (lecture) time.
This test will concentrate on parametric equations for curves and the calculus of parametric curves, polar coordinates (including area and length in polar coordinates

and equations of conic sections), vectors in two and three dimensions, the equations of lines and planes in 3D and the vector dot and cross products.

Unit Exam 2: **Friday, March 20, 2008.**
Held during class (lecture) time.
This test will concentrate on differential calculus for functions of several variables. Equations of surfaces in 3D together with vector functions and space curves will be included, as will limits in two and three dimensions (emphasis on 2D case). Finding and using partial derivatives and directional derivatives will be important (including the Chain Rule for functions of several variables), with the main application being maximum and minimum values of functions with several variables.

Unit Exam 3: **Friday, April 24, 2008.**
Held during class (lecture) time.
This test will concentrate on constrained optimization (Lagrange multipliers) and multiple integrals. Computation and application of double and triple integrals will be very important, and these integrals will be set up and computed using Cartesian, cylindrical and spherical coordinates. This test will also include some introductory topics in vector calculus, including vector fields, line integrals of vector fields and Green's Theorem.

Approximately one week before each unit exam, a set of review problems will be posted on the course web site. The lecture and recitation section immediately before the exam will be devoted to working through review problems in preparation for the exam.

Unit Exam Do-Overs:

When I write each of the unit exams, I will write two versions of the test. These won't be exact clones of each other but will be over the same unit of material and be of approximately the same level of difficulty.

One of these versions of the test will be given as the unit exam during class on the day announced in this document.

The second version of the test will be given approximately seven to ten days later (when everyone has received their graded unit exam back). This test will be given outside of regular class time and will be open to anyone who wants to take it.

The score that we will use when computing your final grade in the course will be the higher of these two scores. If you take the one of the tests (the version given in class or the version given later), you will receive the score you get on that test. If you take both

tests (the version given in class and the version given later) you will receive the higher of the two scores. If you take neither test, you will receive a score of zero.

The purpose of this policy is to recognize that during your first semesters in college, you are learning a lot about the expectations of college-level courses, what you do and do not know (and how to recognize this), what is expected of you when you take an exam in college, how long it will take to prepare yourself for a test, and what you should do to get yourself prepared. All of this can be quite different from the courses you are accustomed to, and you will need time to adapt. The idea of giving you the opportunity to take a similar test at a later date is to allow you to start to figure these things out for yourself without doing severe damage to your grade in the class.

Because of the obvious logistical problem of the end of the semester, there is no "do-over" opportunity for the cumulative final exam.

Note Card Policy:

You will be allowed to make and use note cards for the each of the unit exams and on the final exam. On each unit exam, you will be allowed to use one (1) note card measuring not more than three (3) inches by five (5) inches. I will bring a pair of scissors to the exams and will be happy to trim larger cards down to size for you before the test begins. On the cumulative final exam, you will be allowed to use up to two (2) note cards, each measuring not more than three (3) inches by five (5) inches.

The reason for two (rather than 3) note cards on the final exam is so that you have a powerful incentive to carefully examine the state of your mathematical knowledge at the end of the semester and review what you do and do not know well. This will help you prepare for the cumulative final exam. If you were allowed three note cards on the final exam, some people would be tempted to cut corners and just use the cards they had made for the unit exams.

Quizzes:

During recitation on Thursdays, you will have the opportunity to complete a quiz on the material covered in the preceding three lessons. Some of the best things that you can do to prepare for each quiz are:

(a) Attend lecture and recitation regularly,
(b) Participate in class and ask questions when you are confused,
(c) Complete as many suggested problems from the textbook as you can (you will be able to find these posted on the course web site), and,
(d) Seek help when/if you need it.

Each Thursday, your TA will begin the recitation by giving you the opportunity to ask about the review problems you have been assigned. The TA will do his or her best to answer as many questions and work as many problems as possible. When the questions

have been answered, or when there is only a limited amount of time left in the recitation, the quiz will begin.

During the semester, there will be a total of ten (10) quizzes given. When computing your final grade in the course, we will drop the lowest two (2) quiz scores. If you are absent from recitation when a quiz is given and you don't have a good excuse, then the missed quiz will count as one of the scores that will be dropped.

Your TA will not give make-up quizzes except in cases of a serious, documented emergency (e.g. serious illness that prevents you from attending recitation and/or lecture).

Homework:

Once per week you will be required to complete a homework assignment consisting of problems from the course textbook. Each homework assignment will consist of approximately ten (10) problems from the textbook. Of these, five (5) problems will be graded. As there is no way of knowing which problems will be graded, you should do your best to complete all of the problems on each homework assignment.

I explicitly encourage you to feel free to work with other students in the course and seek out help either from me or from your recitation instructor when working on the homework problems. The whole point of doing the homework is for you to develop your understanding of math. The points that the homework contributes to your final grade at the end of the semester are nice but not the main point of the exercise. To this end, **simply copying another person's homework is not permitted** because it deprives you of the opportunity to figure out what is going on. If the grader detects copying (e.g. exactly the same nonsensical work on two papers) then all students involved will receive zero credit for the assignment and the matter will be referred to the head of the Math Department, the Dean and the Dean of Student Affairs.

There will be ten (10) homework assignments due during the course of the semester. Homework assignments can be found on the course web site. Completed homework is due in **at the start of recitation on Tuesdays, starting with Tuesday, September 2.**

If you cannot hand in your homework at the start of the recitation section when it is due, you can still hand in the homework by taking the completed assignment to the Mathematical Sciences office (6113 Wean Hall), putting the assignment in your TA's mail box, and sending your TA an e-mail to let them know it is there. If you do all this, then your homework will be graded **although you will receive a 50% penalty for handing it in late**.

Solutions to the homework problems will be posted on the course web site on Wednesday afternoons. For this reason, no homework will be accepted for credit after noon on Wednesday.

At the end of the semester, the lowest two (2) homework scores will be dropped. If you miss a homework assignment, the missed homework assignment will count as one of the scores to be dropped.

Grading Homework:

When you write out your solution to each homework problem, you should clearly indicate your final answer *and* show how you obtained your final answer through appropriate mathematical calculations and manipulations. If it helps to draw a diagram or graph, or to write a few sentences of explanation, then you should do this.

If you don't show how you obtained a particular answer, the maximum score that you will get for that problem is one (1) point out of a possible three (3), even if your answer is completely correct. "Explanations" like "This is what my calculator said," "This was obvious to me," etc. that do not actually show how the answer was obtained will not impress the grader and not garner any credit.

Each problem on the homework will be graded on a 0-3 point scale, as outlined below.

Problem solution submitted	**Score**
All sections of problem completed correctly and written up in a way that is comprehensible to the grader.	3
All sections of problem completed with convincing work shown throughout, but either some of the answers are not correct or some of the work not comprehensible to the grader.	2
Correct answer given but work is either missing or incomplete. Alternatively, some (but not all) of the problem has been attempted with convincing work shown, but solution is incomplete.	1
Solution not submitted.	0

Office Hours:

I will have a number of office hours per week. I will hold my office hours on:

Office Hours 1: Monday, 2:00pm-3:00pm, 6124 Wean Hall
Office Hours 2: Tuesday, 9:00am-11:00am, 6124 Wean Hall
Office Hours 3: Wednesday, 2:00pm-3:00pm, 6124 Wean Hall
Office Hours 4: Thursday, 10:00am-11:00am, 6124 Wean Hall

These office hours are good places to get help on homework problems, help with the course in general and help when you are preparing for a quiz or exam in the course.

If you are unable to attend these office hours, feel free to make an appointment with me outside of these scheduled hours. I'm always happy to meet with students outside of class time provided a mutually agreeable time can be found for the meeting.

Your TA will also hold office hours and you should check with him or her to find out when and where these will be held.

Medical Excuses:

Students who miss a quiz or exam due to illness should obtain a note from their physician stating that the student's medical condition was sufficiently severe that in the physician's professional opinion, taking an exam would have posed a serious danger to the student's health. This note should be on official stationary (e.g. letterhead from the physician's office). This is the minimal level of documentation needed for the possibility of a make-up quiz or exam to be given.

Americans with Disabilities Act:

Any students with a disability that may entitle them to special academic consideration need to obtain official documentation of their disability from CMU's Disability Resources Office. This office is located at 102 Whitfield Hall and their phone number is (412) 268-2013. Documentation should be obtained and given to the instructor in a timely fashion. I appreciate and require at least one week's notice in order to make the necessary arrangements for special accommodations in either the instructional or assessment portions of the course.

Cheating:

Dishonest behavior (including but not limited to communicating with other students concerning the problems covered on quizzes and tests, altering answers to test questions after the fact, or taking a test more than once under different names) will not be tolerated. Any student found engaging in such practices will face disciplinary procedures.

Overview of Topics in the Course:

The overall goal of this course will be for you to gain a thorough knowledge of fundamental topics of limits, derivatives and their applications, and integrals. In terms of coverage, we will do our very best to cover most of the material from Chapters 9, 10, 11, 12 and the first half of Chapter 13 of Stewart's book. An important goal that we will work together to achieve this semester is to get you to the point where you can use your knowledge of math (and calculus in particular) to understand the new ideas in the engineering, science and technology courses that you will go on to when you have finished with this course.

The topics that we will cover are listed on the next two pages. The schedule is my best guess at this point. I expect that we will try to stay up with this schedule but not be rigidly bound to it as the semester goes on.

Date	Topic	Textbook
1/12	First day introductions and course policies.	
1/13	NO RECITATION SECTION TODAY.	
1/14	Parametric curves.	9.1
1/15	Quiz #1 on class policies.	
1/16	Calculus on parametric curves.	9.2
1/19	MLK Day – NO CLASS.	
1/20	Homework #1 due. Finding formulas for parametric curves.	
1/21	Polar coordinates.	9.3
1/22	Quiz #2 on parametric curves and polar coordinates.	
1/23	Areas and lengths in polar coordinates.	9.4
1/26	Conic sections in Cartesian and polar coordinates.	9.5
1/27	Homework #2 due. Length of a DNA molecule.	
1/28	Summary of Parametric curves and polar coordinates.	9.1-9.5
1/29	Quiz #3 on areas and lengths and conic sections.	
1/30	Three dimensional coordinate systems.	10.1
2/2	Vectors.	10.2
2/3	Homework #3 due. Visualizing surfaces in 3D.	
2/4	The dot product and vector geometry.	10.3
2/5	Quiz #4 on conic sections, vectors and the dot product.	
2/6	The cross product.	10.4
2/9	Equations of lines and planes in 3D.	10.5
2/10	No homework due. Proving vector identities.	
2/11	Review for Unit Exam 1.	
2/12	No quiz. Review for Unit Exam 1.	
2/13	**Unit Exam 1 (held during class time).**	
2/16	Cylinders and quadric surfaces in 3D.	10.6
2/17	Homework #4 due. Sketching graphs of 3D surfaces.	
2/18	Vector functions and space curves.	10.7
2/19	Quiz #5 on the cross product, lines and planes, and sketching surfaces in 3D.	
2/20	Functions of several variables.	11.1
2/23	Limits in two and three dimensions.	11.2
2/24	Homework #5 due. When do limits exist in two dimensions?	
2/25	Partial derivatives.	11.3
2/26	Quiz #6 on limits in two dimensions.	
2/27	Tangent planes and linear approximations.	11.4
3/2	The Chain Rule for functions of several variables.	11.5
3/3	Homework #6 due today. Differentials and error formulas.	
3/4	Directional derivatives, interpretation and applications.	11.6
3/5	NO RECITATION SECTION TODAY.	
3/6	Finding and classifying critical points.	11.7

3/9 to 3/13 Spring Break – NO CLASS OR RECITATION.

3/16	Finding maximum and minimum values.	11.7
3/17	No homework due. Practice finding maximum and minimum values.	
3/18	Review for Unit Exam 2.	
3/19	No quiz. Review for Unit Exam 2.	
3/20	**Unit Exam 2 (held during class time).**	
3/23	Lagrange multipliers.	11.8
3/24	Homework #7 due. Practice with Lagrange multiplier problems.	
3/25	More on Lagrange multipliers.	11.8
3/26	Quiz #7 on Lagrange multipliers.	
3/27	Double integrals and double Riemann sums.	12.1
3/30	Double integrals on general regions.	12.2
3/31	Homework #8 due. Applications of double integrals.	
4/1	Double integrals in polar coordinates.	12.3
4/2	Quiz #8 on double integrals.	
4/3	Triple integrals.	12.5
4/6	More on triple integrals.	12.5
4/7	Homework #9 due. Practice visualizing and setting up triple integrals.	
4/8	Triple integrals in cylindrical coordinates.	12.6
4/9	Quiz #9 on double and triple integrals.	
4/10	Triple integrals in spherical coordinates.	12.7
4/13	Vector fields.	13.1
4/14	Homework #10 due. Visualizing vectors fields in 2 and 3D.	
4/15	Line integrals of vector fields.	13.2
4/16	NO RECITATION SECTION TODAY.	
4/17	Spring Carnival – NO CLASS.	
4/20	Green's Theorem.	13.4
4/21	No homework due today. Green's Theorem and the planimeter.	
4/22	Review for Unit Exam 3.	
4/23	No quiz. Review for Unit Exam 3.	
4/24	**Unit Exam 3 (held during class time).**	
4/27	Curl and divergence operators.	13.5
4/28	Quiz #10 on vector fields, line integrals and Green's Theorem.	
4/29	Surface integrals.	13.7
4/30	Review for the cumulative final exam.	
5/1	Review for the cumulative final exam.	

5/4-5/20 Final exam period. Final exam time and place to be set by registrar.

Additional Help with the Course:

In addition to lecture, recitation sessions and office hours, the University operates a walk-in peer tutoring center in the Mudge Library and the Donner Reading room.

These peer tutoring sessions are held in the evenings on Sunday-Thursday night from 8:00pm to 11:00pm.

Individualized tutoring and other help options are available through the Academic Development Office. This is located in Cyert Hall B5 and the phone number is (412) 268-6878.