Preliminaries

1. Introduction

This course is the second is a sequence of courses about calculus. I am assuming that students know the basics of what is typically called "differential calculus" as well as a small bit of "integral calculus." In particular, I am assuming the following:

- Students have a conceptual understanding of limits.
- Students understand the concept of differentiation.
- Students can compute derivatives of explicit and implicit functions (using, perhaps, the chain rule, product/quotient rule, logrithmic differentiation, or some other technique).
- Students can use differentiation to solve basic applied problems, including optimization and approximation.
- Students know what anti-differentiation is, and can find some basic anti-derivatives.
- Students know, conceptually, what an integral is.
- Students are familiar with the (second) fundamental theorem of calculus, and can compute some basic integrals using anti-derivatives.

I should say a small bit about my philosophy regarding mathematics and calculus.

(1) Part of my perspective is that functions (and not numbers) are one of the central objects in the study of mathematics. Calculus is a collection of tools which is used to study (certain classes of) functions. You will find this perspective cropping up frequently in my classes, including this one.
(2) Mathematics is interesting intrinsically (on its own) and in relation to other disciplines and sociological contexts. I want so explore the beauty and wonder of mathematics, and to explore connections to other disciplines.
(3) Historically, calculus has had a special relationship with other disciplines, especially the natural sciences (in particular, those known today as "physics"). As such it is easy to package calculus as being very "applied" and for good reason – there are a great many fun and wonderful applications of calculus in the sciences; I hope to share some of these.
(4) Calculus also has an interesting place in the history and development of mathematics itself; the process of making calculus "rigorous" (or "mathy") was related to a large number of important developments in mathematics. While many of the ideas uncovered in this story are technical (and thus postponed to our Real Analysis class), I hope to share a few fun pieces of this story as well.

2. Resources

There is no textbook required for this course. Nevertheless, it is helpful to have resources to consult. Here are some suggestions:

Physical books. There are several competing "standard" textbooks. Any edition of the following books will address the basic ideas of this course:

- Calculus book(s) by Robert Smith and Roland Minton.
- Calculus book(s) by James Stewart.
- Calculus book by Steven Krantz

Online resources. There are many, many online resources available for calculus. Here are two I recommend in particular.

- Gilbert Strang (MIT) has made his calculus course available at
  http://ocw.mit.edu/resources/res-18-001-calculus-online-textbook-spring-2005/textbook/
- The Whitman Calculus book can be found at:
  http://www.whitman.edu/mathematics/multivariable/

3. Structure of the course

Class sessions. Typically, class sessions will consist of interactive lectures. While the schedule of topics for the course is rather full, there is some room for flexibility; if need be I will use class time for working on example problems in groups or other activities of the sort.

Outside of class. I expect you to spend a fair amount of time outside of class working on problems. While I encourage working collaboratively, it is important that you be able to do all problems on your own. A good test is this:

> If you walk in to an empty classroom and find one of the homework problems written on the board, can you immediately walk up the board and, without consulting your notes or another person, complete the problem?

Homework. My plan is to cover roughly one topic, as listed in the table of contents, per week. Each topic comes with a collection of homework problems, which will be collected shortly after we have finished discussing the topic in class. *It is important to begin work on the homework problems as soon as possible!*

Exams. There will be an in-class midterm exam following the completion of topic 8. The date will be announced a minimum of one week prior to the exam.

There will be a final exam during the official final exam period. Consult the Registrar's web page

> http://college.lclark.edu/offices/registrar/final_exam_schedule/

for a schedule of final exam periods.

4. Expectations, policies, and all that

I expect all students to approach this course (and their other endeavors) as responsible adults, taking ownership and pride in what they do.

Below are some descriptors of certain aspects of this expectation, as well as some specific policies. In no way is this a comprehensive or complete list of expectations.

In class:

- Attend all class sessions, arriving on time and ready to be mentally engaged.
- Be respectful of yourself and of others.
- You are welcome to bring a beverage or a small snack to class, provided that they do not become a distraction or interfere with the course. Please do not bring large meals, noisy foods, pungent items, etc. No soup.
- While I encourage you to take notes, please ask for permission before taking photographs, video recordings, audio recordings, etc. I forbid students from making any recordings of my classes available to others.

Coursework:

- Submit work you are proud of – work that is neatly written, complete, correct.
- Submit all work on time.
- Substandard work (late, illegible, not properly labeled, etc.) may not receive credit.

Getting help:

- Office hours: I am available weekly in my regularly scheduled office hours.
- The SQRC has many tutors who can help with linear algebra. Furthermore, the SQRC has the advantage of being open late. For more details, see:
  https://college.lclark.edu/departments/mathematical_sciences/sqrc/
- It is also possible to get tutoring through SAAB. See
  http://college.lclark.edu/student_life/associated_students/saab/tutor/
- For more general issues, I strongly encourage students to contact one of:
  - Academic Advising: http://college.lclark.edu/academics/support/advising/
  - Counseling Services: http://www.lclark.edu/offices/counseling_service/for_students/
  - Ombuds Office: http://www.lclark.edu/offices/ombuds/

Miscellaneous:

- All (relevant) college policies apply in my classroom. This includes policies regarding appropriate behavior, academic integrity, etc.
- For pedagogical reasons, as well as to remain sane, it is important to remain flexible. Thus, while this document provides some guidelines and structure, it is not to be read as legally-binding contract or anything of the like. I reserve the right to change the structure of the course in order to provide an appropriate and productive learning environment.
- The word "miscellaneous" is somewhat challenging to spell.

5. Grades

Grading scale. I use the 4.0 scale for all grades. A conversion between letter grades and their numerical equivalents, as well as definitions of the letter grades, can be found in the *Academic Policies and Procedures* section of the Undergraduate Catalog:

http://docs.lclark.edu/undergraduate/policiesprocedures/grading/

Grades for individual assignments. Here is how grades are assigned for individual homework assignments and exams.

Homework grades: I compute two homework grades for each assignment. The first is an average of scores on individual problems, and measures content mastery. The second is grade is a measure of completion, where a completed homework assignment is assigned a grade of 4.0 and an incomplete assignment is given a score 0.0.

Exam grades: Each problem on an exam is assigned a grade on the 4.0 scale. A total exam grade may be computed by means of a (possibly weighted) average of the grades for individual problems.

Course grades. Course grades are computed by the following (admittedly complicated) procedure.

(1) I first compute three different grades:
   Formula grade: Computed by averaging homework and exam grades with the following weighting:

Homework	30%	Midterm exam	30%	Final exam	40%

   Exam grade: A weighted average of the midterm and final exams, with the midterm weighted 40% and the final weighted 60%.
   Final exam grade: This is simply the final exam grade.
(2) I then assign a "provisional grade" that is the best of the three grades above.
(3) The provisional grade is then adjusted based on improvement over time. Improvement is primarily measured using the homework grades, but are also based on the extent to which the final grade differs from the midterm grade. The result is the "adjusted grade."
   It is important to note that (1) the adjustments can be either positive or negative, and (2) that adjustments are made wholly at my discretion.
(4) In order to obtain the "course grade" from the adjusted grade, a comparison is made between the adjusted grade and the final exam grade and the following principles are enforced:
   - Only in exceptional circumstances should the course grade differ from the final exam grade by more than one letter grade (i.e. by more than 1.0 grade points).
   - A failing grade (F) on the final exam results in a failing course grade.
(5) Once the course grade has been determined, it is converted in to a letter grade and reported to the Registrar's office.