Instructor   Dale Winter.
Office   Room 506, Science Center.
Phone   (617) 495-9063.
e-Mail   amanita@math.harvard.edu

TF   Grace Chan.
e-Mail   gchan@fas.harvard.edu

Texts   *Calculus: An Integrated Approach to Functions and Their Rates of Change.*
                 (Preliminary Edition.) by Robin Gottlieb. Available from the Coop.

Calculators Any graphing calculator will be an tremendous asset in this course. I strongly
                 recommend that you use a calculator and bring your calculator to class each day.
                 I know how to use TI-82 and TI-83 calculators quite well and can offer help with
                 these.

1. Meeting times

I am delighted to meet with you individually outside of class whenever we can find a mutually suitable time to meet. You are each welcome to speak with me before or after class to arrange a meeting time, or to communicate via phone or e-mail.

Office Hours.

I will be holding office hours in 506 Science Center from *2:00 to 3:00 p.m.* on *Mondays, Tuesdays, Wednesdays, Thursdays* and *Fridays*.

2. Information on the Web

We will have a course web site for important information about the course. I will let you know what the URL for this web site is as soon as that information becomes available Homework assignments and solutions to homework problems will be posted on this web site during the semester. I will make all important course announcements in class. These announcements will also appear on the web site.

3. Attendance and Excellence

I understand that some of you may have already encountered some of the material of this course. I believe that you will strive for excellence in this course, and will be disappointed if your performance does not measure up to your expectations.

In this class, we *will not have a class-wide attendance policy*. Instead, we *will have an excellence policy*. As long as you are able to understand the material and produce work that is acceptable to both you and me, you are free to make your own decisions about class attendance. We will follow the schedule of topics on the course syllabus closely. If you are *not* performing up to the standards that you and I feel appropriate, then we will meet to discuss the situation, and make plans for improvement.

I hope that you will get a lot out of class, see class as a profitable use of your time and *want* to come along each day. My experiences of teaching indicate that students who:

- do the assigned readings from the textbook and laboratory materials,
- attend class regularly,
- make a good effort to complete homework on time,
- seek help when they need it,
- study seriously for tests, quizzes and exams

tend to have a much better chance of achieving excellent results in the class.

4. Help Sessions and Labs

There will be three "help" or "problem" sessions each week, run by Grace. These help sessions will be held from **1:00 - 2:00pm** on **Monday, Tuesday and Thursday** each week. During these problem sessions you are welcome to ask questions about the course material, homework problems and laboratory assignments. You are also welcome to meet with your classmates during these problem sessions to work collaboratively on homework assignments and lab reports.

Generally speaking, on Thursday you will spend your time in class working on a laboratory assignment with a partner. The work that you complete during these laboratory sessions will be handed in as a lab report. Grace and I will be available to help you with your work and to assist your learning during these lab sessions. Each lab report will count for the same as one homework assignment.

5. Teamwork

I see absolutely nothing wrong with students working in teams to complete homework assignments and to prepare for tests. I do see a lot of problems with one student completing a homework assignment, and then a collection of individuals transcribe the work, presenting it as their own. When working collaboratively on a piece of work, please be careful to follow the guidelines described in: "Writing with Sources. A Guide for Harvard Students." It is a policy of this course that all homework must be written up individually.

Grading, Homework, Tests and Exams

1. Grade Breakdown

Your semester grade is based on a weighted average of *all scores* accumulated from the different parts of the course. The table given below shows the weight that will be given to each of the parts of the course.

	Percentage
Labs	6%
Gateways	4%
Homework	20%
Mid-terms[1]	40%
Final Exam	30%
Total	100%

If your grade on the final exam is higher than the grade from your composite score, then your final grade for the course will be the same as your grade on the final exam.

2. The Curve

In this class we will have a simple way to convert numerical scores to letter grades. This method is:

Range of Numerical Values	*Letter*
90-100	A
80-89	B
65-79	C
50-64	D
0-49	E

When I calculate your final grade at the end of the course, I will calculate a score on a 0-100 scale using the scores that you have obtained during the course in accordance with the grade breakdown given above. Your course grade will be then be obtained using this table. In the event of a fractional score, I will always round up to the nearest integer. I may modify the final letter grades with a "+" or "-" if I believe that your performance in the class warrants this.

There is only one set of circumstances under which I will deviate from the policy outlined above. This will be to ensure that at least 20% of the people in the class get grades of "A" and at least 30% of people in the class get grades of "B" (ignoring "+" and "-").

---

[1] Your higher scoring mid-term will be worth 25%, and the other mid-term will be wort

3. Homework

Each week, you will be assigned three homework assignments. The days on which assignments will be given out, and days on which they are due are given below.

Day homework assigned	Due date
Monday	Next day (Tuesday)
Tuesday	Next day (Wednesday)
Thursday	Following Monday
Thursday (Lab Report)	Next Day (Friday)

In general, **no late homework can be accepted**. The only exceptions to the regulation will be serious personal emergencies such as hospitalization.

In the few situations where the due date of a homework assignment or lab report falls on a day when an exam is scheduled, the due date for the homework will be oficially postponed to the next class day following the exam.

Each homework assignment will consist of ten questions. Over the course of the semester, the composition of these questions will average out to be something like:

- 65%: Mathematical operations, solving equations, making calculations. Fairly straight-forward uses of course content and concepts that do not involve complicated applications or modeling.
- 25%: Mathematical modeling of phenomena, starting with a fairly precise and explicit description of the phenomena that can be readily translated into mathematical symbols, graphs, etc. (Problems like this will typically also involve calculations, solving equations, etc.)
- 10%: Investigations into more complicated phenomena. (This will likely also involve both modeling and mathematical operations.)

4. Exams

The exams will be given on:

- *Friday, July 13. 10:00am-noon. (Held during class.)*
- *Friday, August 3. 10:00am-noon. (Held during class.)*
- *Tuesday, August 14. 9:15am-12:15pm. (Place to be announced.)*

During the mid-terms, you will be allowed to use your calculators and one standard, letter-sized (8.5 by 11 inches) page of notes. Yes, you can write on both sides of the sheet of paper.

5. Gateways

During the course, you will be required to take and pass four master-oriented tests called gateway tests. These tests will be straight-forward tests of fundamental skills. You may take the gateway tests as many times as you need to. You will be provided with all of the questions that could be used on the gateways (and answers) before you take the tests (except for Gateway #1) so that you can prepare thoroughly.

The subjects of the gateways and the times that they will be given during class are:

- Gateway 1 (Basic algebra skills): Monday, June 25.
- Gateway 2 (Concepts of Series): Monday, July 16.
- Gateway 3 (Derivatives): Wednesday, August 1.
- Gateway 4 (Integration): Thursday, August 9.

You can re-take gateways during any office hour (M, T, W, Th, F 2-3pm).

When you pass a gateway, it counts as a perfect score for a homework assignment.

For every gateway that you have not passed by 5pm on Friday August 10, your final grade for the course will be reduced by one letter. Four example, if you don't pass any of the gateways by 5pm on Friday August 10, then your "A" would turn into a "D," your "B" into an "E" etc.

Course Description - Preliminary Version

The course is divided into six related units that build upon one another.

Unit 1: (6/25 to 7/9) Describing phenomena using graphs, numbers, words and symbols.
                 Making predictions and answering questions using mathematical analy
                 when the phenomena is described by a function.

Unit 2: (7/9 to 7/10) A mathematical tool for making sense of infinitely large and
                 infinitesimally small.

Unit 3: (7/11 to 7/17) Making sense of phenomena that are described using rates of change.

Unit 4: (7/18 to 7/27) Making sense of the idea of instantaneous rate of change.
                 Calculating instantaneous rates of change for functions.
                 Finding functions to describe a phenomenon when you know the rate c
                 change.

Unit 5: (7/30 to 8/3) Describing phenomena that change in a periodic fashion.
                 Instantaneous rate of change for periodic phenomena.

Unit 6: (8/6 to 8/10) Making sense of phenomena of phenomena that are described using
                 instantaneous rates of change.
                 Finding functions to describe a phenomenon when you know the rate c
                 change.
                 Tools for approximating complicated situations.

The day by day breakdown of the course is given below. Please note that the textbook sections listed are not
intended to be compulsory reading assignments. They are intended simply as pointers to relevant sections of
the textbook that are relevant to the ideas and calculations encountered in each class.

Day	Time	Topic	Textbook
6/25	10am	Making predictions. The definition of a function.	1.1, 1.2
	11am	Representations of functions. Gateway #1 (Algebra)	1.3
6/26	10am	Interpreting graphs, tables, words and symbols.	1.3, 2.1, 2.3
	11am	Modeling relationships using linear functions.	4.1, 4.2
6/27	10am	Interpreting the parameters of a linear function. Rates.	4.3, 2.3
	11am	Exponential growth and exponential functions.	9.1, 9.2
6/28	10am	(LAB) Linear regression.	4.4
	11am	(LAB) Modeling relationships using exponential functions.	9.3
6/29	10am	Solving equations with linear equations and exponentials.	13.2, 13.2
	11am	Rates of change and concavity.	2.1, 2.3, 10.2
7/2	10am	Combining functions.	3.1, 3.4
	11am	Power functions.	6.2, 6.3
7/3	10am	Quadratic and polynomial functions.	6.4, 11.1
	11am	Predicting the appearance of the graph of a function.	11.1
7/4	10am	Independence Day - no class.	
	11am	Independence Day - no class.	
7/5	10am	(LAB) Fitting a function to data.	N/A
	11am	(LAB) Rational functions and their graphs.	11.4
7/6	10am	Compositions of functions. Inverses.	3.2, 3.3, 12.1
	11am	Inverse functions. Logarithms.	12.1, 12.2, 12.3, 13.2

Date	Time	Topic	Sections
7/9	10am	Functions defined in pieces.	N/A
	11am	Right hand and left hand limits of functions.	7.2
7/10	10am	Limits of functions.	7.3
	11am	Limits and infinity. Asymptotes and rational functions.	7.3, 7.4
7/11	10am	Quantities that change over time. Series.	18.1, 18.2
	11am	Limits and series. Infinite series.	18.3, 18.4
7/12	10am	(LAB) Tools for managing personal finances.	18.5
	11am	Review for Exam #1.	N/A
7/13	10am	EXAM #1. (Held during class time.)	N/A
	11am	EXAM #1. (Held during class time.)	N/A
7/16	10am	Finite and infinite series in general.	N/A
	11am	The idea of a convergence test. Gateway #2 (Concepts of Series)	N/A
7/17	10am	Discrete growth and continuous growth.	N/A
	11am	Short term predictions of the behavior of a function.	4.1, 8.1
7/18	10am	Average and instantaneous rates of change.	2.3, 5.1
	11am	Limits and rates of change. The mathematical notion of instantaneous.	5.2, 5.3
7/19	10am	(LAB) Using series to approximate areas and volumes.	22.1, 28.1
	11am	(LAB) Using series and limits to calculate the volume of a pyramid.	28.1
7/20	10am	Calculating the instantaneous rate of change of a function.	8.1
	11am	Graphical and verbal interpretations of the instantaneous rate of change.	5.4, 8.2
7/23	10am	Short cuts for calculating instantaneous rates.	8.3
	11am	The instantaneous rate of change for exponential and logarithms.	9.4, 14.1, 14.2
7/24	10am	More short cuts for calculating instantaneous rates.	8.3
	11am	Relating the function, derivative and second derivative.	11.2, 11.3
7/25	10am	Locating the local and global extrema of a function.	10.1, 10.2
	11am	Optimization.	10.3
7/26	10am	(LAB) Relating the behavior of a function and its derivatives.	N/A
	11am	(LAB) Optimization.	10.3
7/27	10am	The Chain Rule for derivatives.	16.1, 16.3
	11am	Applications of the Chain Rule. Related Rates.	16.3, 17.3, 17.4
7/30	10am	Modeling periodic phenomena. Graphs of sine and cosine.	19.1, 19.2
	11am	Circle and triangle definitions of trigonometric functions.	19.3, 20.1
7/31	10am	Solving equations. Inverse trigonometry functions.	20.3, 20.4
	11am	Derivatives of trigonometry functions and their inverses.	21.1, 21.2
8/1	10am	Applications of derivatives of trigonometry functions.	21.3, 21.4
	11am	Gateway #3 (Derivatives)	N/A
8/2	10am	(LAB) Processes described by continuous change.	15.2, 31.1
	11am	Review for Exam #2.	N/A
8/3	10am	EXAM #2. (Held during class time.)	N/A
	11am	EXAM #2. (Held during class time.)	N/A
8/6	10am	Changes over time and areas under graphs.	22.1, 22.2
	11am	Definite integrals. Applications and properties of definite integrals.	22.2, 22.3, 22.4
8/7	10am	Relating functions, derivatives and definite integrals	24.1, 24.2
	11am	Calculating antiderivatives.	25.1
8/8	10am	Calculating antiderivatives. Integration by substitution.	25.2
	11am	Integration by substitution.	25.3
8/9	10am	(LAB) The radioactive fallout from the Chernobyl incident.	N/A
	11am	Gateway #4 (Antiderivatives and definite integrals)	N/A
8/10	10am	Qualitative analysis of Differential Equations.	31.1, 31.3
	11am	Symbolic solutions of Differential Equations.	31.2, 31.4

8/14   9:15am-12:15pm   FINAL EXAM