

Calculus I

MAT 1225 Winter 2005

Instructor: Dr. Brian Gill

Office: OMH 209

E-mail: bgill@spu.edu

Phone: 281-2954

Web page: <http://myhome.spu.edu/bgill>

Prerequisites: MAT 1110 (Algebra and Trigonometry) or its *college* level equivalent. Mastery of the basic skills of algebra and trigonometry is absolutely essential for success in this course. On the first day of class, an Algebra/Calculus placement exam will be given. If you attain a passing score on the placement exam, then the prerequisite will be waived. If you do not get a passing score on the placement exam, then you **MUST** take MAT 1110 before taking this course.

Course Materials:

Textbook: *Calculus*, 5th edition, by James Stewart. See the attached schedule for details of the material to be covered. A variety of valuable supplements for the textbook are also available for purchase, including a student solutions manual and a study guide.

Computer Software: The class will meet in a computer classroom equipped with one PC for every two students. A variety of mathematical and statistical software is available on these computers, including the computer algebraic system Maple (version 9.5). Substantial use of Maple will be made in this class and in many subsequent math courses. Maple will be available for use on computers in labs throughout the campus. You are also strongly encouraged to purchase a copy of the software for use on your own computer. It will be available for purchase at a substantial discount for students using a discount code provided by your instructor.

University and Departmental Mission: Seattle Pacific University seeks to be a premier Christian university fully committed to engaging the culture and changing the world by graduating people of competence and character, becoming people of wisdom, and modeling grace-filled community. The mathematics department at Seattle Pacific University seeks to provide excellent instruction to enable our students to be competent in the mathematics required for their chosen fields, and to share our expertise with the community through service and leadership. Hence, common goals for students in mathematics courses include 1) becoming competent in the topics covered in the course, 2) demonstrating skills and attitudes which contribute to professional, ethical behavior, 3) the ability to communicate mathematically, in both written and verbal form, and 4) learning to appreciate the beauty and utility of mathematics.

Course Objectives: This course provides an introduction to differential and integral calculus. The primary aims of the course are to help students develop new problem solving and critical reasoning skills and to prepare them for further study in mathematics, the physical sciences, or engineering. By the end of the course, students should acquire skills needed to

- compute limits by graphical, numerical, and analytical methods;
- mechanically calculate derivatives of algebraic and trigonometric functions and combinations of functions;
- use derivatives to sketch graphs and solve applied problems;
- evaluate definite and indefinite integrals; and
- use Maple effectively to explore and solve problems.

In addition to the specific skill-oriented objectives above, students should

- have a better overall conceptual understanding of functions and their graphical, numerical, analytical, and verbal representations;
- understand derivatives as rates of change;
- understand definite integrals as accumulations of a rate of change and as Riemann sums;
- understand the relationship between derivatives and integrals;
- understand the difference between definite and indefinite integrals;
- have improved skills at problem solving and critical thinking: at dissecting a complex problem, determining steps in its solution, finding the solution, and testing whether it is reasonable; and
- be able to provide clear written explanations of the ideas behind key concepts from the course.

Students should also gain an increased appreciation of mathematics as part of the language of science and as a study in itself. Finally, I hope that you will have fun accomplishing all of these objectives, even if the material is difficult and the course takes a lot of time and effort.

Grading and Course Expectations

Exams: There will be three in-class midterms and a cumulative final exam. The midterms are tentatively scheduled for January 24, February 10, and March 1. The final exam will be Monday, March 14 from 1:00 to 3:00 pm.

Most questions on the exams will be very similar to exercises from the homework. You also may be expected to be able to state some definitions and to provide written explanations of some of the key ideas of the course. You may be required to use computers and Maple for exam #3 and portions of the final exam.

Homework: The only way to truly learn calculus is to work as many exercises as possible. There will be homework assignments given virtually every day. All assignments will be posted on the course website. Homework must be turned in at the beginning of class on the day it is due; *homework will not be accepted once class has started*. Your work must be neat and easily readable or you will receive NO credit. You must show all of your work – a correct answer with no justification will also be worth NO credit (particularly for odd problems with answers in the back of the book...). Not all homework exercises will be graded. On a typical homework assignment, five representative exercises will be selected for grading and your grade for the assignment will be based on those five exercises only.

I strongly encourage you to come to my office to ask me questions about the homework. You are also encouraged to work with other students on the homework, but you must individually write up and turn in your own solutions. You are required to list on your paper all other individuals that you worked with or that assisted you in any way with the assignment – failure to do so will be considered cheating (turning in someone else's work as your own).

Quizzes: There may be occasional short quizzes (typically unannounced). The questions on the quizzes will typically be *very* similar to exercises from the homework assignment that was collected that day. There may also be occasional short pre-tests and post-tests on certain topics, which will be counted as quizzes.

Maple Labs: During the quarter you will work through six exploratory labs in class using a computer and the mathematical software Maple. These labs are intended to lead you "discover" key concepts of calculus on your own through carefully designed explorations using Maple. Each of the labs is adapted from *Learning by Discovery: A Lab Manual for Calculus*, Anita Solow, editor, 1993. The book is volume 27 of the MAA Notes Series published by the Mathematical Association of America.

You will work through each of the labs with a partner. Following the lab, you will be asked to write up a detailed "lab report" and turn in a single copy of the report for you and your partner.

Attendance: Attendance will not be taken, but if you expect to succeed in this course, it is essential that you come to class every day. Unless you have an acceptable excuse *and* make special arrangements with me *before* class begins, missing an exam or quiz or failing to turn in an assignment on time will result in a grade of zero. Late homework will not be accepted for any reason and no make-up quizzes will be given, but if you have an acceptable excuse and contact me before class, I will drop the homework or quiz score.

NOTE: Things such as oversleeping, lack of preparation, or sneezing twice are NOT acceptable excuses. Acceptable excuses include a death in your immediate family or a *severe* illness, and *you are responsible for providing me with documentation of your excuse*.

Course Grades: Course grades will be determined by a weighted average of your scores on the homework, quizzes, labs, and the four exams. Homework and quizzes will be worth a combined total of 20% of your course grade. Your three lowest homework or quiz scores will be dropped at the end of the quarter. The lab reports will be worth a total of 15% of your course grade. The 3 midterms will each be worth 15% of your grade and the final exam will be worth 20%. Course grades will be based on the following scale:

	93-100% A	90-92% A-
87-89% B+	83-86% B	80-82% B-
77-79% C+	73-76% C	70-72% C-
67-69% D+	60-66% D	Below 60% E

A grade of I (incomplete) is only given for non-academic reasons such as a severe illness that prevents you from completing the course. You must have a passing grade on the material that you have completed in order to receive an incomplete.

Office Hours: My office hours will be announced in class and posted on the course website. You are strongly encouraged to drop by my office to ask questions, discuss problems, and just to get to know me better. If you are unable to meet with me during the scheduled times, I am available at other times by appointment. I also maintain an "open door" policy – any time that my office door is open, you are welcome to drop in to talk to me, even if it is not during my scheduled office hours.

Additional Notes:

Calculators: Calculators will be permitted on all exams. Any basic scientific calculator or a graphing calculator such as the TI-81, TI-82, TI-83, or TI-85 will be allowed. However, calculators which are capable of symbolic manipulation (such as the TI-89 or TI-92) are *NOT* permitted. If you have any doubt as to whether or not your calculator is acceptable, please ask me as soon as possible.

E-mail: All SPU students have an SPU e-mail address. I will make use of these SPU e-mail addresses to send information to all members of the class, so you should check your e-mail regularly. If you do not use your SPU e-mail account, there is a utility available through Banner to set up your SPU e-mail account to forward messages to some other e-mail address. I strongly recommend doing this so that you do not miss any important messages.

Please note that while it can be a great tool for quick communication, *e-mail is rarely a good substitute for face-to-face conversations and is very poorly suited for answering mathematical questions.* When you come to my office to ask me questions, I engage you in a discussion about the problem, ask questions about what ideas you have for approaching the problem, explore various possible approaches (and what goes wrong with some of them), etc. In the process, I can usually find out precisely where your difficulties lie and help you to learn how to get past them. Such a conversation is impossible by e-mail. Furthermore, typing and e-mailing mathematical symbols is very time consuming, and the resulting equations in the e-mail often come out garbled (or even completely missing).

Students with Disabilities: Students with disabilities need to contact Disabled Student Services in the Center for Learning to request academic accommodations. Disabled Student Services sends letters out to all your professors indicating the appropriate accommodations for the classroom based on your disability. Once you have done this, you should also make an appointment to meet with me as soon as possible to discuss the details of how we will implement the accommodations in this course.

Modifications to the course requirements (such as the addition of quizzes) can be made at any time. It is your responsibility to know all course requirements as described here or announced in class.

“The chief aim of all investigations of the external world should be to discover the rational order and harmony which has been imposed on it by God and which He revealed to us in the language of mathematics.”

Johannes Kepler (1571-1630)

Tentative Class Schedule

The table below provides a listing of topics that I plan to cover from the text. The exact dates on which we cover material will almost certainly vary somewhat from this list. Also, topics may be added to or removed from this list at any time.

Date	Section
1/4	Algebra/Calculus Placement Exam
1/5	Introduction to Calculus
1/6	Maple Lab 1: Graphing Functions: New Functions from Old Functions
1/7	Brief coverage of review material in chapter 1
1/10	Maple Lab 2: Introduction to Limits of Functions
1/11	2.2 The Limit of a Function
1/12	Maple Lab 3: Slope of a Curve
1/13	2.3 Calculating Limits Using the Limit Laws
1/14	2.5 Continuity
1/17	No Class – Martin Luther King Jr. Birthday
1/18	2.1 and 2.6: Tangents, Velocities, and Other Rates of Change
1/19	3.1 Derivatives
1/20	3.2 The Derivative as a Function
1/21	Review
1/24	Exam #1
1/25	3.3 Differentiation Formulas
1/26	3.4 Rates of Change in the Natural & Social Sciences
1/27	3.5 Derivatives of Trigonometric Functions
1/28	3.6 The Chain Rule
1/31	3.6 The Chain Rule
2/1	3.7 Implicit Differentiation
2/2	3.8 Higher Derivatives
2/2 & 2/3	3.9 Related Rates
2/4	3.10 Linear Approximations & Differentials
2/7	4.1 Maximum & Minimum Values
2/8	4.2 The Mean Value Theorem
2/9	Review
2/10	Exam #2
2/11	Maple Lab 4: Relationship between a Function and Its Derivative <i>Last day to withdraw from classes</i>
2/14	No Class – Presidents' Day
2/15 & 2/16	4.3 How Derivatives Affect the Shape of a Graph
2/17	4.4 Limits at Infinity; Horizontal Asymptotes
2/18	4.5 Summary of Curve Sketching
2/21	4.6 Graphing with Calculus and Calculators
2/22 & 2/23	4.7 Optimization Problems
2/24	4.10 Antiderivatives
2/25	Maple Lab 5: Riemann Sums and the Definite Integral
2/28	Review
3/1	Exam #3
3/2	5.1 Areas & Distances
3/2 & 3/3	5.2 The Definite Integral
3/4	Maple Lab 6: Area Functions
3/7 & 3/8	5.3 The Fundamental Theorem of Calculus
3/9	5.4 Indefinite Integrals & the Total Change Theorem
3/10	5.5 The Substitution Rule
3/11	Review
3/14	Final Exam 1:00-3:00 pm