

MATH 19 SYLLABUS, WINTER 2005

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1. DIFFERENTIAL CALCULUS

Differential calculus came about largely from attempts to solve the so-called tangent problem: given a point on a curve, one is asked to find the line which passes through this point and is tangent to the given curve. Solving the tangent problem leads one to investigate limits of functions and, ultimately, to the definition of the derivative of a function. In this course we'll work to find an appropriate expression for the derivative of a function, become masters at computing derivatives of many of our favorite functions, and see a smattering of applications of the derivative. It will be nothing short of fantastic.

2. EXPECTATIONS

2.1. Prerequisites. Students in this class need a solid understanding of concepts from high school algebra. These include, but are not limited to, knowledge of standard mathematical notation and vocabulary; comfort with the concept of a function; familiarity with basic algebraic, trigonometric, and exponential functions and their inverses; a mastery of all things concerning lines (how to compute slope, several ways to write the equation for a line); and the ability to manipulate algebraic expressions (i.e., simplify fractions, factor polynomials, etc.). We will spend class time reviewing many of these concepts. Students who fear they do not have a solid background in algebra should see the professor for help.

2.2. In-Class Expectations. Unlike high school math classes, the emphasis of this class will be not on computation alone. Though it sits on a bedrock of algebra, calculus is not itself concerned with the manipulation or simplification of expressions. A large part of lecture will be devoted to discussing the concepts which drive calculus, and students are expected to understand both these concepts and their applications.

2.3. Assignments. Students are expected to write their assignments cleanly and clearly. Points will be deducted from assignments which are illegible or which contain faulty logic, even if the final answer is correct. Answers which do not show a student's work will receive zero credit.

3. GRADING

A student's grade is computed as follows: 20% Midterm 1, 20% Midterm 2, 20% Quiz Average, 15% Homework Average, 25% Final. Grades will be posted on coursework.

3.1. Tests. There will be 2 mid-term examinations and 1 final. The first mid-term will be Monday, January 31, and the second will be Monday, February 28. Test times and rooms will be announced later. The final will be given at the designated test date and time. Calculators may not be used on tests.

3.2. Quizzes. There will be one in-class, timed quiz per week, for a total of ten quizzes during the term. Quizzes will last about 10 minutes each and be given on Fridays after homework has been handed in and discussed. Calculators may not be used on quizzes.

Quizzes test the material covered in the week's homework assignment. Students who feel comfortable with the homework assignment should do well on quizzes, so your best preparation for a quiz is to understand your homework!

Your lowest 2 quiz scores will be dropped when computing your quiz average.

3.3. Homework. There will be one homework assignment due each Friday, with the exception of the first week of class. Homework will be due at the beginning of class, and late homework is not accepted. If you must miss class on a day that an assignment is due, it is your responsibility to hand your homework in before the beginning of the class period in which the assignment is due. Your homework average is computed by dropping the two lowest homework grades during the term.

Diligence with homework is the best preparation for all quizzes and tests. Students who can solve homework problems on their own and in a timely manner will perform well in this class. Students are permitted to discuss the homework problems with whomever they like, but must write up solutions on their own. In particular, homework solutions may not be written during office hours or group discussions; students may take notes when discussing problems with other people, but should put these notes away before writing up the homework assignment.

4. RESOURCES

4.1. Office Hours. Students are highly encouraged to attend office hours to discuss concepts covered in class or ask questions about homework assignments.

4.2. Text. The course is centered around Stewart's *Single Variable Calculus*. Homework assignments will be taken primarily from this book, so students should have a copy of the text for the course. It also provides another source for understanding the course material.

4.3. Course Webpage. Homework assignments and practice exams, and solutions to homework assignments and exams, will be posted at the course webpage. Course notes (pun intended) will also be available. The address is <http://math.stanford.edu/~aschultz/math19>.

4.4. Tutoring. The Center for Teaching and Learning offers *free* tutoring to undergraduates. You can find out more about this at the tutoring webpage: <http://tutoring.stanford.edu>.

4.5. Your classmates. Discussing problems with classmates is a great way to hear new ideas for attacking problems. Remember, though, that students must write up homework assignments on their own.

5. PRELIMINARY COURSE OUTLINE

W	1/5	Introduction	1.3	Q1
F	1/7	Fun with functions	1.5, 1.6	
M	1/10	Lines and an intro to tangents	2.1	Q2, HW1
W	1/12	The limit of a function	2.2	
F	1/14	Properties of limits	2.3	
M	1/17	Holiday - No Class		Q3, HW2
W	1/19	Limit laws and continuity	2.3, 2.4	
F	1/21	Tangent problem, revisited	2.6	
M	1/24	The derivative at a point	2.7	Q4, HW3
W	1/26	The derivative at a point, again	2.7	
F	1/28	Linear approximation	2.9	
M	1/31	Review for Midterm 1		Midterm 1
W	2/2	The derivative as a function	2.8	Q5, HW4
F	2/4	The derivative as a function, again	2.8	
M	2/7	Derivatives of polynomials, exponentials	3.1	Q6, HW5
W	2/9	The product rule	3.2	
F	2/11	Examples		
M	2/14	Derivatives of trigonometric functions	3.4	Q7, HW6
W	2/16	The chain rule	3.5	
F	2/18	More fun with the chain rule	3.5	
M	2/21	Holiday - No Class		Q8, HW7
W	2/23	Derivatives of logarithmic functions	3.7	
F	2/25	Examples		
M	2/28	Review for Midterm 2		Midterm 2
W	3/2	Implicit differentiation	3.6	Q9, HW8
F	3/4	Examples		
M	3/7	Selected applications		Q10, HW9
W	3/9	Selected applications		
F	3/11	Selected applications		