

Course Information

Single Variable Calculus
MTHS 630

Professor Irene Mulvey

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Text*:

Calculus, seventh edition

By James Stewart

Thomson; Brooks/Cole

ISBN-13: 978-0-538-49782-4

ISBN-10: 0-538-49782-3

* I have lots of extra copies of the book that students can borrow for the length of the course.

Course Overview:

We will cover in detail all the topics of Calculus – differential calculus, integral calculus, sequences and series. We will cover everything from the very beginning. The course will be rigorous but *very* fast-paced because this material is typically covered in a year-long undergraduate sequence. As a graduate course, I'm expecting the students to be able to absorb the material more quickly and in depth. All that is needed are an open mind, very basic algebra skills, and a willingness to work hard for 10 classes. Students should come away with a deep knowledge and appreciation for the calculus as well as insight into how to more effectively teach mathematics.

- Differential calculus (four classes): limit, continuity, derivative, differentiation rules, implicit differentiation, extreme values, Mean Value Theorem, curve-sketching and optimization.
- Integral Calculus (four classes): area under a curve, definite integral, The Fundamental Theorem of Calculus, some transcendental functions, some techniques of integration.
- Sequences and Series (two classes): definitions, some tests for convergence for series, power series, Taylor and Maclaurin Series.

We'll use a graphing calculator (I'll have a TI-84 plus, but a TI-83 or higher will be fine) to demonstrate many of the concepts of calculus and see how this tool has transformed the teaching of calculus. There will be some readings posted to provide a little historical context.

Plan/Requirements:

Classes will be lectures with as much student participation as we want.

At every class, (optional) exercises will be assigned and will be discussed at the next class, if needed. These exercises do not have to be written up or handed in; the intent is to give students some fairly straightforward practice problems to help in understanding the material.

Problem sets will be assigned at each class. The solutions to these problems must be written up and handed in by the given due date (the “class after next”). You can ask questions and get hints on these problems at the following class and hand them in at the class after that. All problems will be equally weighted and the problem grades will be averaged for the final grade.

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Detailed Class Plan:

Class #1: Introductions, discussion of prerequisite material, functions. The two motivating problems of calculus. Limits, calculating limits.

Text: 1.4, 1.5, 1.6, 1.7 as time permits.

Class #2: Continuity, the derivative, differentiation formulas, derivatives for trigonometric functions if time permits.

Text: 1.8, 2.2, 2.3, 2.5, 2.4 if time permits.

Class #3: Implicit differentiation, related rate problems if time permits, extreme values for a function, the Mean Value Theorem

Text: 2.6, 2.8 if time, 3.1, 3.2.

Class #4: Derivatives and graphing functions, Optimization problems if time permits, antiderivatives.

Text: 3.3, 3.7 of time, 3.9.

Class #5: The definite integral, the Fundamental Theorem of Calculus

Text: 4.2, 4.3

Class #6: Some techniques of integration, some applications of integration.
4.5, some of chapter 7, 5.1 if time.

Class #7: The exponential function, the natural logarithm function.

Text: 6.1, 6.2*, 6.3*, 6.4* and 6.5 if time.

Class #8: Some techniques of integration, improper integrals

Text: some 7.1, 7.2, 7.3, 7.4; 7.8

Class #9: Sequences & series, some tests for convergence of series, introduction to power series.

Text: 11.1; 11.2; some of 11.3, 11.4, 11.5, 11.6; 11.8.

Class #10: More on power series. Taylor and Maclaurin series.

Text: 11.8, 11.9, 11.10.