Calculus for the Physical and Life Sciences 2

MATH 132-02, MWF 9:00 - 9:50, Tue. 9:30 - 10:20, Haberlin 322, Spring 2006

Professor Gareth Roberts

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Office hours: Mon. 10:00 - 10:50, Tues. 10:30 - 12:00, Wed. 12:00 - 1:00, Fri. 8:00 - 8:50 or by appointment.

Required Text: *Calculus (single variable), Fourth ed.*, Hughes-Hallett, Gleason, McCallum, et al. It is suggested, but not required, that you also purchase the *Student's Study Guide* which is directly linked to the textbook.

Web page: `http://mathcs.holycross.edu/~groberts/Courses/MA132/homepage.html` Homework assignments, Maple labs, schedule changes, exam materials, useful links and other important information will be posted at this site. Please bookmark it!

Syllabus: This course picks up where MATH 131 left off. The main focus is on integration of real-valued functions of a single variable and some of the applications of integration to the physical sciences. We will also investigate series, Taylor polynomials and series, and differential equations. The subject will be approached from both a conceptual and a computational viewpoint. Rather than just learning a set of formulas, techniques and algorithms, the theory and applications of calculus will be central to our study. The text has been chosen with this goal in mind. Many of the exercises require a solid understanding of concepts as opposed to a cursory "plug-and-chug" approach.

A tentative outline of the course is given below. We will cover most of the material in the text from Chapters 6 through 11. An extra class is included for certain topics, allowing for a possible computer lab day. In addition, review for the three midterms will occur in class the Wednesday before the exam.

- Introduction to the course, review of the definite integral (2 classes)
- Antiderivatives: construction of, Second Fundamental Theorem of Calculus (5 classes)
- Techniques of Integration: u-substitution, parts, partial fractions, trig. sub. (8 classes)
- Exam I (Covering Chapter 6 and first half of Chapter 7)
- Approximating definite integrals, Simpson's rule, improper integrals (4 classes)
- Applications of Integration: area, volume, volumes of revolution, arc length (4 classes)
- Applications of Integration: density, center of mass, physics, probability (5 classes)
- Infinite Series: sequences, geometric series, convergence versus divergence (4 classes)
- Exam II (Covering second half of Chapter 7, Chapter 8 and first half of Chapter 9)
- Convergence tests for infinite series, power series (4 classes)
- Taylor polynomials and series, error approximations of Taylor polynomials (5 classes)
- Differential Equations: simple examples, slope fields, Euler's method (4 classes)
- Exam III (Covering second half of Chapter 9, Chapter 10 and start of Chapter 11)
- Differential Equations: separation of variables, modeling, population growth (5 classes)

- Calculus Jeopardy (last class)
- Final Exam (Cumulative)

Homework: There will be homework due every Wednesday at the START of class. Assignments will be posted on the course web page. There will be a list of problems for you to hand in, a nonempty subset of which will be graded. While you are allowed and encouraged to work on homework problems with your classmates, the solutions you turn in to be graded should be your own. Take care to write up solutions **in your own words**. Plagiarism will not be tolerated and will be treated as a violation of the Departmental Policy on Academic Integrity.

It is highly recommended that you take advantage of the **Calculus Workshop**, a drop-in peer tutoring center, open Sunday through Thursday from 7:00 - 9:00 pm in SWORDS 328/330. This is an excellent place to get help while you are working on homework problems or studying for exams.

NOTE: LATE homework will NOT be accepted. The only excused homework which is late will be accompanied by a letter from your Class Dean. However, you will be allowed ONE "mulligan" over the course of the semester where you can turn in the assignment up to one week after the original due date.

Computer Labs: Certain classes will involve the use of technology to illustrate and explore some aspect or application of Calculus. These will be days of collaborative learning and may include using the mathematical software package Maple in the departmental computer labs. You will be asked to complete 4 computer projects working in groups of 2 to 3 people.

Exams: There will be 3 evening midterm exams and a comprehensive final at the end of the semester. The exam schedule is given below. Please make a note of these dates and plan accordingly. Any conflicts must be legitimate and brought to my attention well before the exam is scheduled. If you have any specific learning disabilities or special needs and require accommodations, please let me know early in the semester so that your learning needs may be appropriately met. You will need to contact Dr. Matthew Toth of Disability Services in Hogan 207 (x 3693) to obtain documentation of your disability.

Exam Schedule:

Exam 1	**Thur., Feb. 23**	**6:00 - 7:30 pm**
Exam 2	**Thur., March 30**	**6:00 - 7:30 pm**
Exam 3	**Thur., April 27**	**6:00 - 7:30 pm**
Final	**Sat., May 13**	**8:30 - 11:30 am**

Academic Integrity: The Department of Mathematics and Computer Science has drafted a policy on academic integrity to precisely state our expectations of both students and faculty with regards to cheating, plagiarism, academic honesty, etc. You are required to read this policy and sign a pledge agreeing to uphold it. Anyone who violates the Departmental Policy on Academic Integrity will receive a 0 for that assignment as well as possible further disciplinary action involving your Class Dean.

Grade: Your course grade will be based on the following breakdown:

- homework and computer labs 30%
- midterm exams 40% (best exam 17%, second best 13%, worst 10%)
- final exam 25%
- classroom participation and interest 5%

How to do well in this course:

- ATTEND CLASS, PARTICIPATE and ASK QUESTIONS.

  I take pride in my lectures and will work hard to get you to master the course material. However, this will not be of much use to you if you don't attend class. Furthermore, many class periods involve group work and/or activities designed to improve your engagement and understanding of the material. Be an aggressive learner — ask questions when you don't understand something or if you're just plain curious. It is a privilege to attend Holy Cross. Value your time here and I will do my best to make it worth your while.

- DO YOUR HOMEWORK REGULARLY.

  The best way to learn mathematics is to *do* mathematics. This means mastering the material to the point where you could explain it to your classmates and your friends. "You don't really learn the subject until you teach it," is a common adage amongst mathematicians. It is not enough to know how to mimic an algorithm. A strong student should be able to follow and propose arguments as to why an algorithm is working or not working.

- WORK WITH YOUR CLASSMATES.

  Some of the best assets available to you are the knowledge and abilities of your peers. Learn to work and communicate with your classmates. Mathematics can be fun and rewarding when there are people around you who enjoy figuring out problems as much as you do. Take advantage of this opportunity and organize study groups.