Course Objectives: Continue to learn how to do mathematics! Mathematics is a problem-solving discipline, and we are all constantly learning. The best way to learn is to focus on technique and not on memorization. My role as professor is to guide discussions and help you take the next step from wherever you are mathematically. One objective is for you to have a sound enough understanding of calculus that you can recognize it and apply it in future courses. This will not happen if you have just memorized your way through some problems. A broader objective is for you to be a good problem-solver, to help you excel at whatever entrance examinations and job situations are in your future. An objective related to problem-solving ability is critical reading. To that end, you will be asked to read the book and put new concepts into your own terms. Finally, an objective is to enjoy the course. Calculus is the gateway to the awesome world of modern science. Let yourself be amazed!

Intended Learning Outcomes: At the end of the course, successful students will be able to

- Apply techniques of differentiation and integration to model and solve problems
- Understand the role of calculus and the limit in modern mathematics
- Calculate, by hand, rudimentary limits, derivatives and integrals
- Recognize the role of technology in calculus, understand when it should be used, and be aware of its limitations

Attendance Policy: This class meets four days per week. Regular attendance is expected. This means both physical and mental attendance; for most students, taking notes is a good way of making the best use of class time. You are responsible for everything done in class, through your attendance and sharing class notes with classmates. If you miss a class, you must e-mail or call me before class is over and explain why. If you have two unexplained absences, you will be dropped from the course.

Equipment: We will use graphing calculators in class and on tests. The TI-83 or equivalent is fine. We will not use any special features of calculators, and calculator answers do not earn credit on tests. We will also use Mathematica, a powerful mathematical software package, in labs and on tests. A personal copy for your personal computer is recommended, so that you can have it in class daily. Reading quizzes will be taken using Clickers. You need to get one and either register it online or tell me the (lengthy) clicker ID. As well, Clickers will be used to give feedback on technical issues or misunderstandings that arise in class discussion.

Academic Integrity: The college policy is fully supported. Tests are closed notes, closed book. You may always ask me for help on homework and labs. Do not copy homework or any portion of a lab report. No electronic devices other than calculators are allowed in a test situation.

Study Problems: In each section, a group of problems will be assigned. You should attempt every problem before that section is discussed, and ask questions in or out of class about problems that you do not understand. Study problems are the basis for tests. Test questions will be similar to study problems.
Homework: You will be asked to read ahead and work (typically) one basic problem from the next section to be discussed. Reading quizzes will assess your understanding of concepts and guide class discussion. In conjunction with class discussion of that section, the study questions will be discussed; these are the basis for test questions. Homework will be graded partly on effort and partly on correctness. Late homework is not accepted. If you miss class, get a friend to turn in your homework for you. Reading quizzes cannot be taken late. The more work you do, the easier the class is!

Co-Curricular: During the course of the semester, you must attend at least two approved co-curricular events offered by the MCSP department. For each, write a two-paragraph description of the event, due within a week of the event. A sample is provided. Schedules for the talks can be found online at the MCSP department website (www.roanoke.edu/mcsp) and in Trexler hallways.

Study Help: A calculus faculty member will be available in Trexler 271 from 7-9 on most Tuesdays. The intent of these hours is to provide an evening time in which students can gather, do homework, and catch up on any material that is unclear. If you use this time to learn the material, you will not need to cram the night before the test. Evening hours have been a grossly underused resource! Please take advantage of this time.

Calculus Lab: We will meet in Trexler 374 every Thursday from 8:30-10:00. This time will be spent working in groups on various problems, often interesting applications of the calculus we are studying. This time is informal and should be noisy. Do not hesitate to ask questions of me and your classmates.

Extra Credit: You may earn extra credit in a number of ways. My intent is to encourage you to have fun with mathematics, and that is the grading criterion that I will use – so have fun learning! You may check out from the Roanoke College library and report on “popular” mathematics books. You may report on mathematical web sites that have good calculus demonstrations or extra material. You may write reviews of class: explanations or activities that were especially helpful or unhelpful, questions that were raised by something we did but are too technical to cover in class (office hours are a great time for this, and can count in place of a written report) are possible topics.

Tests: There will be four tests and a final exam. Each test will cover all material discussed since the previous test. Anticipated test dates are (Th) 2/9, (Th) 3/1, (Th) 3/29 and (T) 4/19. The exam is Wednesday, April 25, 8:30-11:30.

Make-ups: In case of sickness or scheduling conflicts, get in touch with me ASAP.

Grading: The lab reports count 15% of the final grade. Daily homework, reading quizzes, co-curricular and class participation count 10%. The exam counts 15%. Each test counts 15% of the final average. Grades may be curved up based on participation, one unusually low test score or other extenuating circumstance.
A: 93-100 A-: 90-92 B+: 87-89 B: 83-86 B-: 80-82 C+: 77-79 C: 73-76 C-: 70-72
D+: 67-69 D: 63-67 D-: 60-62 F: 59 and below
Calculus FAQ

1. **Is Calculus 2 harder than Calculus 1?**
The answer depends on a number of factors. Calculus 2 has fewer topics than does Calculus 1, so the material is more unified. The main topic in Calculus 2 is infinite series, which is notably more abstract than, for example, differentiation and integration. Students who are used to cramming formulas often struggle with infinite series, which must be understood and not memorized. The main determining factor in whether it is harder is how you approach the course. If you learn more in class, keep up with the material better, and get more involved in class discussions, you will find that you have made Calculus 2 easier. Correcting for various factors, the grades are essentially the same in Calculus 2 as for Calculus 1.

2. **Why did I get a bad grade on the first test? I studied 10 hours the night before the test.**
You didn’t prepare properly. If you did not listen and learn in class and reinforce that learning by immediately going over notes and working practice problems, then you put yourself in too big of a hole. Studying the night before should be limited to reviewing what you’ve already learned, making connections between different types of problems and making sure that you can understand the terms that will appear in a test question; and then get some sleep. Exhausting yourself trying to memorize unfamiliar material will not work. Neither will spending long hours in a study group that spends more time socializing than working.

3. **I missed class. When can you show me what you did in class?**
That won’t happen. You should get class notes from somebody, read through the notes, try some practice problems, and then come by with specific questions about the material. I will be glad to help you catch up, but there are not enough hours in the day for each student to get a personal 60-minute lecture. In any case, an important part of class is the give and take between students and professor, and I can’t recreate that in my office.

4. **What do I need to get on the exam to get an A in the course?**
As a qualified Roanoke College student, you have the skills to take the grading scale in the course syllabus and your grades on all past assignments and compute your average, and then determine what you need to finish with an A average. More importantly, whether you need an 84 or a 97 on the exam, you should prepare to get the best score that you can on the exam.

5. **Why do you care if I walk out of class to get a drink of water or text in class?**
It is a distraction for somebody to stand up in the middle of class, walk in front of the board and leave class. Is there an emergency and you need help, or are you just bored? Neither one is good. It would take time to find out which one it is, and doing so would disrupt the class. If you’re texting in class, you’re announcing to me that you have no interest in learning whatever it is we are talking about. There is a high correlation between students who have no interest in learning and students who do not learn. I try very hard to make class activities worthwhile – please participate.

6. **What can I do to improve my overall performance in this class?**
Start by going to every class and taking good notes. After class review your notes and try practice problems. As soon as you realize you have a question about something, go get help! (Good ways to get help include: my office hours, evening office hours for Calculus, my office hours, CLT tutors, my office hours, and starting a study group with other students in your class.)
Model Reflection Paper

(This is made up, but shows what I’d like to get from you. The two main elements are (1) brief summary of talk and (2) some original thought on the subject.)

The talk on September 7th was by Dr. Sue Dokoo of Pseudo Duke University. Her research is in the game of Sudoku and discussed different aspects of this game. I have seen other people playing it, but did not know the rules or any of the mathematics behind it.

In this game, a 9x9 playing space is provided. An example given was:

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To “solve” the puzzle, one could just enter numbers in a brute-force kind of way to see if they could get a working configuration. However, sitting in a room full of mathematicians, taking a more analytical approach seemed to be the dominant strategy. Treating this as a constraint-satisfaction problem, you can identify that certain cells must contain specific values. This leads to the conclusion that there is exactly one solution to a “well-formed” Sudoku.

This got me thinking about well-formed Sudoku, and how they are generated in the first place. It seems unlikely that the seeds are randomly assigned, you run the risk of violating set-up rules. A bigger problem is that the seeds may not constrain the possibilities enough to make a unique solution. Another naïve approach might be to take a completed grid and start taking away numbers, but I suspect that you might have a similar issue in terms of necessary constraints.

One that I want to think about is: In forming a viable Sudoku, is it the number of seeds or the placement of seeds that is more critical? I suspect the latter. Also,

- What is the maximum number of seed numbers that can be provided and still result in an ambiguous (unsolvable) puzzle?
- What is the minimum number of seed numbers that can be provided to generate a (uniquely) solvable puzzle?

We were provided two puzzles – one was rated “Easy” the other “Difficult”.

- What goes into the rating system?
- Does a difficult puzzle necessarily have fewer seed numbers?
- Is the rating of the complexity somehow determined by the deductive skills required?