Math 423, Advanced Calculus I

SDSMT, Fall 2011, 4 credits

Meet Monday, Wednesday, Thursday, and Friday from 12:00–12:50 PM in McLaury 313.

The course text is *A Friendly Introduction to Analysis* (second edition), by W.A.J. Kosmala. We will cover Chapters 1–6, and in particular, prove the Fundamental Theorem of Calculus. We may also cover supplemental material as time or interest permit.

A tentative course outline can be found on the class webpage.

Instructor information

Dr. Travis Kowalski (either “Travis” or “Dr. K” is fine)
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Webpage: [http://www.mcs.sdsmt.edu/tkowalsk/math423](http://www.mcs.sdsmt.edu/tkowalsk/math423)
We will be using WebCT; visit [http://sdmines.sdsmt.edu/webct](http://sdmines.sdsmt.edu/webct) for more information.

Office hours: See the webpage above for tentative office hours. Of course, you can always make an appointment with me; just contact me before or after class.

Course objective and description. The Calculus you thought you knew is just the superficial shell of a monumental beast of theory that lies beneath. This class seeks uncover this real Calculus that has been kept from you all these years: the study of operations involving the infinite through the process of limits. Stated in a less foreboding manner, Advanced Calculus is the rigorous study of the concepts that are presented intuitively in a first-year Calculus course.

This course is based on the calculus sequence (123–125–225). The main objective of this course is to gain a deeper understanding of the fundamental concepts of analysis for real functions, including properties of the real numbers, sequences and series, limits and continuity, differentiation, and integration. Another goal is to develop an appreciation for methods of proof and the ability to present rigorous mathematical arguments.

Minimum prerequisite. Math 225 (Calculus III) completed with a C or better.

Technology. As this is a theoretical rather than a mechanical course, direct access to computational technology is neither required nor expected; any basic graphing calculator will more than suffice for our needs. That being said, technology can give us an appreciation of both the subtleties of the analytic theory and the limitations of our mechanical intuition. Hence, I will make frequent in-class use of Maple, a powerful “computer algebra system” to which you have access from any school computer, and will be happy to assist any student who wishes to learn to use it.

Grading. The grading is based on the following:

- Assignments and Quizzes: 200 points
- 3 Examinations: 100 points each
- Comprehensive Final: 200 points

Letter grades will be assigned according to the following scale:

- A: 630-700 points
- B: 560-629 points
- C: 490-559 points
- D: 420-489 points
- F: less than 420 points

Plus or minus grades are not allowed (Board of Regents policy, Fall 2003). I reserve the right to lower these values as I see fit.

Instruction and attendance. Class will mostly take the form of lecture and discussion. However, we will occasionally have group activities, computer labs, or other meetings as need be. Hence, daily attendance is expected, although I will not police it. You should bring your book to every class period and be prepared by reading the corresponding text material before the coverage of the material in class (and it is likely you will need to read the same material after class). It is expected that you should spend at least 2 hours of study for every hour in class.
Course outcomes. A student who successfully completes Math 423 should be able to

1. write proofs of elementary theorems and proof-based solutions to problems related to:
   - limits of sequences,
   - limits, continuity, and differentiability of functions of a single variable,
   - Riemann integration theory for functions of a single variable; and
2. apply the major theorems of single variable calculus.

Assignments and quizzes. The only way to learn mathematics is to do mathematics, and so we will do two primary activities during the semester:

1. Homework. Each lecture I will also assign some homework problems from the day’s material. Feel free to discuss problems with your peers, but make sure that the individual write-up is your own. Late homework will not be accepted. The problems come in 2 flavors:
   - Starred problems will be submitted and graded by me. I will collect a batch of them most Fridays.
   - Unstarred problems will not be graded by me. However, each student is required to write up a complete solution to at least one unstarred problem to appear on the website as a solution.
2. Quizzes. A mixture of the announced and unannounced, these will be short (10 minute) quizzes based on definitions and the homework, to provide you with some test-taking feedback. The lowest quiz score will be dropped.

Examinations and make-up policy. There will be two in-class and one take-home examination over the semester that will test your mastery of the course material. These will not be comprehensive, and will test both mechanical facility (problems resembling the assigned homework) and original synthesis (problems involving novel ideas). Exams will be announced at least one week ahead of time. For any conflict with a scheduled exam time that is known in advance, the student is obligated to notify the instructor in advance; I will most likely be happy to give you a make-up exam. Exams that are missed with no prior notification or for unexcused reasons will earn a score of 0 and no make-up will be allowed. Notification may be made via email or phoning me, but be sure I contact you back!

Final exam. The final exam will be held on Wednesday, December 19, 2:00–3:50 PM. It will be a comprehensive exam. By decree of the Math Department, under no circumstances will an early final exam be administered!

Special needs. Students with special needs or requiring special accommodations should contact me and/or the campus ADA coordinator, Dr. Jolie McCoy, at 394-1924 at the earliest opportunity.

Classroom behavior. The Student Handbook prohibits the disruption or obstruction of teaching. Activities that are disruptive and/or obstructive to teaching will include, but are not limited to, the following: showing up late to class, eating in class, or the use of electronic noisemakers like cell phones or pagers. If an electronic device disrupts class then the owner will sacrifice their highest homework score for each offense, or pay The Fine. The Fine for electronic device disruption is the purchase of cookies and/or donuts for the entire class. This happens to be similar to a policy used at the state legislature.

Academic dishonesty. If you cheat on a test or assignment, you may fail the course. At the very least, you will get a negative score on that test or assignment since cheating is worse than doing nothing. Discussing a problem with other students is a valuable learning tool; copying someone else’s work is not. All students will be held to the institutional standard for academic honesty and integrity. The following are the relevant sections taken from the student handbook (SD BOR policy), which states that acts of academic dishonesty will include, but are not limited to, the following: Cheating, plagiarism, dishonesty, furnishing false information, or forgery.

State Policy on “Freedom in Learning.” Students are responsible for learning the content of any course of study in which they are enrolled. Under Board of Regents and University policy, student academic performance shall be evaluated solely on an academic basis and students should be free to take reasoned exception to the data or views offered in any course of study. Students who believe that an academic evaluation is unrelated to academic standards but is related instead to judgment of their personal opinion or conduct should contact the dean of the college which offers the class to initiate a review of the evaluation.

Official policies. You can read the official Board of Regents student policies at http://www.sdbor.edu/policy/3-Student_Affairs/documents/3-4.pdf.