

**REAL ANALYSIS OF ONE VARIABLE:
MATH 425A/525A: SECTION 002
SYLLABUS**

FALL 2019

Instructor:	Office:	Office Hours:	Phone:
Robert Sims	ENR2 S346	Thurs. 11 - 12pm Fri. 1-2pm	626-1990

My preferred method of contact is by e-mail: rsims@math.arizona.edu
I will also be in the tutoring room (Math 220) on Mondays from 2 to 3.
I will keep course information on our course website:
<https://www.math.arizona.edu/~rsims/ma425a/ma425A-02.html>
I will keep up-to-date grades for homework and tests online in D2L.

Additional Office Hours: In addition to my office hours, Raymundo Navarrete (who is teaching the other section of Math 425A this semester) has the following office hours:

Mondays from 1-2 pm and Thursdays from 2-3pm in his office Math 717

Catalog Description: Continuity and differentiation of functions of one variable. Riemann integration, sequences and series of functions and uniform convergence.

About the Course: This course is a rigorous introduction to real analysis. Topics include the real number system, continuity, differentiation, integration, sequences and series, as well as sequences and series of functions.

Course Prerequisites: You are expected to have taken an introduction to proofs (typically Math 323: Formal Mathematical Reasoning and Writing) before taking this course.

Course Format and Teaching Methods: This course consists of regular lectures with in-class discussions.

Course Objectives: This course is the first part of a two-semester, senior-level sequence on advanced calculus, which is required for the comprehensive, probability/statistics, and economics/finance tracks of our major in mathematics. The first semester starts with properties of real numbers and then discusses continuity, differentiation, integration, and sequences of numbers and functions. The course is a rigorous introduction to analysis and one of

the most challenging undergraduate courses we teach. By the end of this course, students with a grade of B or higher will be ready to take analysis at the graduate level.

Expected Learning Outcomes: Students will be able to

- use foundational concepts such as completeness, the Archimedean principle, and the Heine-Borel theorem to prove theorems;
- write rigorous proof using ϵ - δ arguments for limits, continuity, and differentiability;
- know and be able to use definitions for the limit of a function at a point, continuity of a function, uniform continuity, derivative of a function, convergence of sequences, the Riemann integral, and point-wise and uniform convergence of sequences of functions;
- check conditions for Riemann integrability of a real-valued function;
- be able to produce counter-examples for common mathematical misconceptions in real analysis;

Course text: The textbook for this course is provided here and on the D2L course site. It is:

Advanced Calculus (second edition) by Patrick M. Fitzpatrick:

<https://ebookcentral.proquest.com/lib/UAZ/detail.action?docID=4718112>

Calculation of Course Grades: For students enrolled in Math 425A, each midterm exam will be worth 100 points and the final exam will count for 200 points. Homework will be assigned roughly once a week. There will be suggested problems and problems to be turned-in for grading. Homework will count for a total of 50 points. For Math 525A the grading scheme and requirements will be identical, except that each week one or two additional homework problems will be assigned for grading.

In this case, for students enrolled in Math 425A, the various components of the course grade will be weighted as follows:

Midterm 1	100 pts
Midterm 2	100 pts
Final Exam	200 pts
Homework	100 pts
Total	500 pts

Hence, each midterm exam is worth 20% of the overall grade, the final exam is worth 40% of the overall grade, and homework is worth 20%.

Course grades will be no lower than the following scale:

90-100% A; 80-89% B; 70-79% C; 60-69% D; Below 60% E

Dates for the Midterms (which are tentative) and Final are as follows:

Midterm 1	Friday, October 4
Midterm 2	Friday, November 15
Final Exam	Thursday, December 19

University rules relating to final examinations, and the university final exam schedule may be found at:

<http://www.registrar.arizona.edu/schedules/finals.htm>

Missed Exam Policy: Students who are unable to attend an exam should notify their instructor as soon as possible. Arrangements for a make-up test will be considered on a case-by-case basis. Make-up exams will be administered only at the discretion of the instructor. If a student is allowed to make up a missed exam, the student must take it at a mutually arranged time. No further opportunities will be extended. Failure to contact the instructor as stated above will result in a grade of zero on the exam.

Homework: Each homework assignment will be graded out of ten points. Five points are available for completeness and five points are available for correctness. Although discussion of homework problems with other students and with the instructor is encouraged, students should write up their own answers. Homework submitted must be a reflection of the student's own knowledge, not another student's knowledge or the knowledge of someone who posted a solution online. Homework should be typed or written in legible, complete sentences, showing calculations and reasoning in a clear, logical order. Homework is due at the beginning of class. When averaging to produce the final homework score of 100 points, your lowest two homework score will be dropped. For this reason, no late homework will be accepted.

Grading Disputes: Any grading disputes must be addressed within one week after an exam or homework has been returned.

Withdrawal and Incompletes: A student may withdraw from the course with a deletion from record through September 6th, using UAccess. A student may withdraw with a grade of **W** through November 1st, using UAccess. A grade of **I** (Incomplete) will be given only at the instructors discretion and according to University Policy as described:

<http://www.registrar.arizona.edu/gradepolicy/incomplete.htm>

Attendance and Class Participation Policy: Participating in the course and attending lectures are vital to the learning process. As such, attendance is required at all lectures. For information on the Administrative Drop Policy, see

<http://catalog.arizona.edu/policy/class-attendance-participation-and-administrative>

If you need to miss class for unavoidable circumstances, contact your instructor as soon as possible. Please note the following: All holidays or

special events observed by organized religions will be honored for those students who indicate affiliation with that particular religion.

<http://policy.arizona.edu/human-resources/religious-accommodation-policy>

Absences pre-approved by the UA Dean of Students (or Deans designee) will be honored.

<https://deanofstudents.arizona.edu/policies/attendance-policies-and-practices>

It is the student's responsibility to notify the instructor in advance of an absence related to religious observation or an activity for which a Dean's excuse has been granted, and to arrange for how any missed work will be handled.

Communication with Students: Announcements and important course information will be discussed in class, indicated on our course website, and announces on D2L. It is the student's responsibility to check for messages and announcements regularly.

Accessibility and Accommodations: It is the University's goal that learning experiences be as accessible as possible. If you anticipate or experience physical or academic barriers based on disability or pregnancy, please let me know immediately so that we can discuss options. You are also welcome to contact Disability Resources (520-621-3268) to establish reasonable accommodations.

Please be aware that the accessible table and chairs in this room should remain available for students who find that standard classroom seating is not usable.

Academic Integrity: Students are responsible to inform themselves of University policies regarding the Code of Academic Integrity. Students found to be in violation of the Code are subject to penalties ranging from a loss of credit for work involved to a grade of E in the course, and risk possible suspension or probation. The Code of Academic Integrity will be enforced in all areas of the course, including, but not limited to homework and tests. For more information about the Code of Academic Integrity policies and procedures, including information about your rights and responsibilities as a student, see the following website:

<http://deanofstudents.arizona.edu/academic-integrity/students/academic-integrity>

Student Code of Conduct: Students at The University of Arizona are expected to conform to the standards of conduct established in the Student Code of Conduct. Prohibited conduct includes: All forms of student academic dishonesty, including cheating, fabrication, facilitating academic dishonesty, and plagiarism. Interfering with University or University-sponsored activities, including but not limited to classroom related activities, studying, teaching, research, intellectual or creative endeavor, administration, service

or the provision of communication, computing or emergency services. Endangering, threatening, or causing physical harm to any member of the University community or to oneself or causing reasonable apprehension of such harm. Engaging in harassment or unlawful discriminatory activities on the basis of age, ethnicity, gender, handicapping condition, national origin, race, religion, sexual orientation, or veteran status, or violating University rules governing harassment or discrimination. Students found to be in violation of the Student Code of Conduct are subject to disciplinary action. For more information about the Student Code of Conduct, including a complete list of prohibited conduct, see the following website:

<http://deanofstudents.arizona.edu/accountability/students/student-accountability>

Other Relevant University Policies Relating to Conduct: Please take note of the following University policies:

- Policy on Threatening Behavior by Students:

<http://policy.web.arizona.edu/education-and-student-affairs/threatening-behavior-students>

- Nondiscrimination and Anti-Harassment Policy:

<http://policy.arizona.edu/human-resources/nondiscrimination-and-anti-harassment>

Expected Classroom Behavior: Students should turn off all electronic devices during class unless the device is deemed necessary for the class by the instructor. This includes, but is not limited to cell phones, mp3 players, and laptops. If you have a disability-related accommodation that involves the use of a computer during class, please discuss this with your instructor in advance.

Changes to the Course Syllabus: The information contained in the course syllabus, other than the grade and absence policies, may be subject to change with reasonable advance notice, as deemed appropriate by the instructor.

Scheduled Topics/Activities:

Below is a tentative list of topics and activities per week. More information can be found on the course calendar which is available on the course website.

Week:	Topics:	Sections:	HW/Midterms:
Aug. 26 - Aug. 30	Completeness Axiom	1.1, 1.2	
Sept. 2 - Sept. 6	Inequalities and Sequences	1.3, 2.1	HW1
Sept. 9 - Sept. 13	Monotone Convergence	2.2, 2.3, 2.4	
Sept. 16 - Sept. 20	Continuity	2.5, 3.1, 3.2	HW2
Sept. 23 - Sept. 27	Uniform Continuity	3.3, 3.4, 3.5	
Sept. 30 - Oct. 4	Inverses and Limits	3.6, 3.7	HW3, M1
Oct. 7 - Oct. 11	Derivatives	4.1, 4.2, 4.3	
Oct. 14 - Oct. 18	Mean Value Theorem	4.4, 4.5, 5.1, 5.2	HW4
Oct. 21 - Oct. 25	Darboux Sums	6.1, 6.2, 6.3	
Oct. 28 - Nov. 1	Fundamental Theorems	6.4, 6.5, 6.6	HW5
Nov. 4 - Nov. 8	Taylor Polynomials	7.1, 7.2, 8.1, 8.2	HW 6
Nov. 11 - Nov. 15	Convergence of Taylor Polys.	8.3	M2
Nov. 18 - Nov. 22	Remainder Theorem	8.4, 8.5, 8.6	
Nov. 25 - Nov. 29	Weierstrass Approximation	8.7, 9.1	HW7
Dec. 2 - Dec. 6	Convergence of Functions	9.2, 9.3, 9.4	
Dec. 9 - Dec. 13	Power Series	9.5, 9.6	HW8