Real Analysis: Math 3080 - 44174

1 Contact Information

Professor:	Dr. Blake Farman
Phone Number:	(318) 342 - 1851
Email Address:	farman@ulm.edu
Website:	https://ulm.edu/~farman
Office:	Walker 3-34
Office Hours:	Monday/Wednesday: 8:00 AM - 12:00 PM 1:45 PM - 2:00 PM 3:15 PM - 4:00 PM

1.1 Preferred Method of Communication

The best way to communicate with me during the semester is through email. I monitor my email during regular business hours and try to respond within one business day.

1.1.1 Official University Email Addresses

The University provides each student with an email address, username@warhawks.ulm.edu, and all official course correspondence will **only** be conducted using official university email addresses.

2 Course Description

This course focuses on proofs of important results in calculus, which we previously have been using without proofs in areas of limits, continuity, sequences, series, differentiation, integration, and infinite series.

3 Course Objectives and Outcomes

The primary goal of this course is to rigorously develop the theory that underlies calculus of a single real variable. An equally important goal of this course is to improve students' ability to read and write mathematical proofs.

4 Course Topics

We will cover material from the first 7 chapters of the textbook: The Real Numbers, Sequences and Series, Basic Topology of $\mathbb{R}$, Functional Limits and Continuity, The Derivative, Sequences and Series of Functions, The Riemann Integral.

5 Course Prerequisites

In order to be eligible to be enrolled in Math 3080 you must have a grade of C or better in MATH 1032 (or equivalent) and a grade of C or better in MATH 3040 (or equivalent).

6 Instructional Methods

This course is offered as a face-to-face course.

- Learning will be facilitated through face-to-face lectures and the textbook.
- Homework assignments and written assessments are to be submitted in class.

6.1 Temporary Remote Instruction (TRI)

During the semester, class and/or campus operations might be disrupted by an occurrence such as a tornado, fire, or illness outbreak that temporarily prevents in-person instruction. Until in-person instruction is possible, the class may enter a phase of temporary remote instruction (TRI). During this phase, instruction will take place via virtual means, either synchronously or asynchronously. Your instructor will alert you when this happens via e-mail and will include a description of how the course will proceed.

6.2 Technical Requirements During TRI

During a period of temporary remote instruction, the need for the course to continue in a virtual manner means that you will be required to have appropriate equipment, software, and telecommunication access to allow you to participate. This course will require that you have the following, should we have to go into TRI:

- A stable internet connection that is capable of joining Zoom meetings and taking assessments.
- A web camera (internal or external) and a microphone that can be used for Zoom meetings.
- A device such as a scanner or a smartphone equipped with a scanning app such as Adobe Scan to upload assessments on Moodle.

7 Evaluation

For the course total, the final grade will be determined as follows:

A:	$[90\%, 100\%]$
B:	$[80\%, 90\%)$
C:	$[70\%, 80\%)$
D:	$[60\%, 70\%)$
F:	$[0\%, 60\%)$

7.1 Weights

Grades will be calculated with the following weights:

Exams:	20%
Homework:	50%
Final Exam:	30%

7.2 Exams

There will be two in-class exams and a cumulative final exam. The exams are tentatively scheduled as follows:

Exam 1:	September 21, 2023.
Exam 2:	October 19, 2023
Final Exam:	Thursday, November 30, 2023, 3:00 PM - 4:50 PM.

7.3 Homework

Homework will be assigned and collected regularly. The homework sets are arguably the most important component for learning the material in this course, so it is important that you complete these sets on time.

An important aspect of mathematics is to communicate mathematical ideas coherently and succinctly. As such, one of the goals of this course is to improve your proof writing skills. To achieve this end, you will be expected to provide complete solutions that are written in complete sentences with appropriate use of symbols on all homework sets. Solutions that are correct but lack justification or are not clear will receive partial credit. Solutions that are incoherent, blank, or illegible will receive no credit.

7.3.1 Cooperation

Students are encouraged to work together on homework with the caveat that **you do not take any written materials away from the collaboration.** For example, you may work together on a blackboard and share thoughts freely on any homework problems, but you should leave the room with no recording of that work (photo, text, etc.) and write up a solution **on your own**.

8 Class Policies and Procedures

At a minimum, all policies stated in the current ULM student policy manual & organizational handbook should be followed (see http://www.ulm.edu/studentpolicy/). Additional class policies include:

8.1 Textbook

The required text for this course is *Understanding Analysis*, Second Edition by Stephen Abbott, ISBN 978-1-4939-2711-1.

8.2 Attendance Policy

Students are expected to adhere to the Class Attendance Policy outlined in the ULM Student Policy Manual.

- Class attendance is regarded as an obligation and a privilege, and all students are expected to attend all required classes in which they are enrolled regularly and punctually. Failure to do so may jeopardize a student's scholastic standing and may lead to suspension from the University. **Students are responsible for the effect absences have on all forms of evaluating course performance.**
- In accordance with University policy, the instructor will take roll regularly. It is the student's responsibility to ensure that his/her attendance is recorded. To be marked present for a given class period, students must stay until the class is completed.
- Each student is responsible for all class material and assignments whether or not the student is present. If a student misses class, then he/she is expected to check Moodle and ULM email for announcements and to work on the assignments listed on Moodle.
- A student accumulating absences of 25% of the class meetings regardless of the reasons (excused or unexcused) will be reported to the Dean of Arts, Education, & Sciences which could result in academic withdrawal from the course or a course grade of F. This may be avoided if the course is dropped; however, it is the responsibility of the student to drop the course. Class removal carries with it the penalties of being assigned a grade of W or F, whichever is appropriate, and no credit for the course. Academic withdrawal may negatively impact a student's full-time status.
- If a student comes to class late, it is his/her responsibility to let the instructor know after class to be counted present and to receive the appropriate attendance credit.
- University Excuses: Any University-related activity requiring an absence from class will count as an absence when determining if a student has met the minimum attendance requirement.

8.3 Make-up Policy

In the event of one missed exam due to absence, the Final Exam can be used to replace the missing exam. Further missed exams will result in a grade of zero. If a University sponsored activity requires you to miss an exam, you must complete the exam in advance.

8.4 Academic Integrity

Faculty and students must observe the ULM published policy on Academic Dishonesty (see the ULM Student Policy Manual – http://www.ulm.edu/studentpolicy/).
Any student caught turning in work that is not their own will be reported to the School of Sciences. If the student is found to be responsible for such a violation, then a formal report will be made to the Office of Student Services and the student will receive **a grade of F for the course**.

8.5 Course Evaluation Policy

At a minimum, students are expected to complete the online course evaluation.

9 Student Services

You can find information about the following available ULM student services at the websites listed below.

- Student Success Center (http://www.ulm.edu/cass/).
- Counseling Center (http://www.ulm.edu/counselingcenter/).
- Special Needs (http://www.ulm.edu/counselingcenter/special.htm).
- Library (http://www.ulm.edu/library/referencedesk.html)
- Computing Center Help Desk (http://www.ulm.edu/computingcenter/helpdesk)

Additional information can be found on The Student Services web site (http://www.ulm.edu/studentaffairs/).

9.1 Disability Accommodations

The University of Louisiana at Monroe strives to serve students with special needs through compliance with Sections 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act. These laws mandate that postsecondary institutions provide equal access to programs and services for students with disabilities without creating changes to the essential elements of the curriculum. While students with special needs are expected to meet our institution's academic standards, they are given the opportunity to fulfill learner outcomes in alternative ways. Examples of accommodations may include, but are not limited to, testing accommodations (oral testing, extended time for exams), interpreters, relocation of inaccessible classrooms, permission to audiotape lectures, note-taking assistance, and course substitutions.

Current policies on serving students with disabilities can be obtained from the ULM website: http://ulm.edu/counselingcenter/. If you need accommodation because of a known or suspected disability, you should contact the director for disabled student services at:

- Voice phone: (318) 342 - 5220
- Fax: (318) 342 - 5228
- Walk In: ULM Counseling Center, 1140 University Avenue (this building and room are handicapped accessible).

If you have special needs of which I need to be made aware, you should contact me within the first two days of class.

9.2 Mental Wellness

If you are having any emotional, behavioral, or social problems, and would like to talk with a caring, concerned professional please call one of the following numbers:

- The ULM Counseling Center (318) 342 - 5220
- The Marriage and Family Therapy Clinic (318) 342 - 9797
- The Community Counseling Center (318) 342 - 1263.

9.3 Title IX

Title IX of the Education Amendments of 1972 prohibits sex discrimination against any participant in an educational program or activity that receives federal funds, including federal loans and grants. Furthermore, Title IX prohibits sex discrimination to include sexual misconduct, sexual violence, sexual harassment and retaliation. If you encounter unlawful sexual harassment or gender-based discrimination, please contact Student Services at (318) 342 - 5230 or to file a complaint, visit www.ulm.edu/titleix.

Remember that all services are offered free to students, and all are strictly confidential.

9.4 Emergency Procedures

The emergency number for the ULM Police Department is (318) 342 - 5350 and should be used for emergency calls. If the campus police are contacted about an emergency for a student, they will go to the student's class to inform the student.

9.5 Discipline / Course Specific Policies

Any policies given here may be altered by the professor if deemed necessary. If this occurs, ample notice will be given.

9.6 FERPA

Do not email or call your professor regarding your course grades. The Family Education Rights and Privacy Act (FERPA) prohibits your professor from discussing your grade in any manner except in person. Please do not have family members, friends, or anyone else contact your professor about your grade as FERPA prohibits your professor from sharing that information with them.

10 Tentative Course Schedule

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Note: The instructor reserves the right to adjust the schedule as needed.

Week 1: August 22, 24

1.3 The Axiom of Completeness
1.4 Consequences of Completeness
1.5 Cardinality

Week 2: August 29, 31

2.2 The Limit of a Sequence
2.3 The Algebraic and Order Limit Theorem

Week 3: September 5, 7

2.4 The Monotone Convergence Theorem and a First Look at Infinite Series
2.5 Subsequences and the Bolzano-Weierstrass Theorem

Week 4: September 12, 14

2.6 The Cauchy Criterion
2.7 Properties of Infinite Series

Week 5: September 19, 21

3.2 Open and Closed Sets
Exam 1

Week 6: September 26, 28

3.3 Compact Sets
3.4 Perfect Sets and Connected Sets

Week 7: October 3, 5

4.2 Functional Limits
4.3 Continuous Functions

Week 8: October 10

4.4 Continuous Functions on Compact Sets
4.5 The Intermediate Value Theorem

Week 9: October 17, 19

Review
Exam 2

Week 10: October 24, 26

5.2 Derivatives and the Intermediate Value Theorem
5.3 The Mean Value Theorem

Week 11: October 31, November 2

6.2 Uniform Convergence of a Sequence of Functions
6.3 Uniform Convergence and Differentiation
7.2 The Definition of the Riemann Integral

Week 12: November 7, 9

7.3 Integrating Functions with Discontinuities

Week 13: November 14, 16

7.4 Properties of the Integral

Week 14: November 21

7.5 The Fundamental Theorem of Calculus

Week 28

Review

Finals Week: November 30

Cumulative Final Exam - 3:00 pm - 4:50 pm