

MATH 3210–001: Foundations of Analysis I

Summer 2025 Syllabus

Time and Location: Monday, Tuesday, Wednesday, Friday 9:00–10:10am in [JTB 140](#)

Instructor: Sean Groathouse
Please feel free to call me Sean
he/him/his pronouns

Email: sean@math.utah.edu

Office Hours (Tentatively): Tuesday, Wednesday, Friday 10:10–10:50 in our normal room
before and after class most days,
or by appointment.

Course Web Page: I will post all course information and announcements on Canvas:
<https://utah.instructure.com/courses/1184790>

Prerequisites: C or better in

- one of these: Math 1260, 1321, 2210, 2310, 3140
- and one of these: Math 2200, 2250, 2270, 2271

Textbook: *Foundations of Analysis*, by Joseph Taylor; ISBN: 9780821889848

The Marriott Library has provided **free online access to our textbook** available here (login with your normal uid):

https://utah-primoprod.hosted.exlibrisgroup.com/permalink/f/dtufc4/UUU_ALMA51513550470002001

You can read the book online, download an ebook, and print or save to a PDF a certain number of pages. This is provided free by the library, and there is no fee.

Course Description and Goals: This is the first course in the MATH 3210–3220 Foundations of Analysis sequence. This class focuses on the theory behind single variable calculus. We'll cover logic, methods of proof and mathematical argument in mathematical analysis, rigorous reconsideration of the real number system, continuity, differentiation, and integration for functions of one variable, and infinite series. The course will emphasize developing the skills to create and communicate rigorous mathematical proofs. The course covers chapters 1–6 of the textbook, which are:

Chapter 1: The Real Numbers, Chapter 2: Sequences, Chapter 3: Continuous Functions, Chapter 4: The Derivative, Chapter 5: The Integral, and Chapter 6: Infinite Series

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

- Describe the real line as a complete, ordered field.
- Determine the basic topological properties of subsets of the real numbers.
- Use definitions of convergence.
- Approximate limits of sequences, sums of series, functions and integrals.
- Determine the continuity, differentiability, and integrability of functions defined on subsets of the real line.

- Apply the Mean Value Theorem, Fundamental Theorem of Calculus, and Taylor’s Theorem to problems in the context of real analysis.
- Determine the convergence or divergence of series of real numbers.
- Create and communicate proofs which are clear, concise, and rigorous.

Grading: Grades will have the following weights and scale:

Homework (Drop Lowest)	20%
Group Quizzes (Fridays, Drop Lowest)	5%
Attendance/Participation (Tuesdays/Fridays)	10%
Class Contributions	10%
Midterms	30%
Final Exam	25%

[93, 100] A	[80, 83) B–	[67, 70) D+
[90, 93) A–	[77, 80) C+	[63, 67) D
[87, 90) B+	[73, 77) C	[60, 63) D–
[83, 87) B	[70, 73) C–	[0, 60) E

Although I’m not philosophically opposed to curving grades, I find it’s usually not necessary. If I do need to curve the grades, I will explain any modifications to this scale on Canvas.

Homework: We will have approximately 11 homework assignments throughout the semester. You will submit your homework as a PDF to GradeScope. You can use GradeScope or a phone scanner to create a PDF of your written work, or type your homework or write digitally. The homework assignments will usually be due on Thursdays by 11:59pm. Late homework is not usually accepted, since we will discuss and post solutions shortly after the due date. Instead, I will drop the lowest homework score. If an emergency or illness come up during the semester, please let me know as soon as possible so we can work something out.

Group Quizzes: We will have a quiz each week on Friday at the beginning of class, except for days of an exam. You are encouraged to work together on the quiz, and also use your notes and the textbook. I will also come around to help if you get stuck. The quizzes are intended to be more like practice tests, that allow us to check our understanding each week. There will generally be no makeup quizzes, but I will drop the lowest quiz score. If an emergency, illness, or school activity comes up, please let me know as soon as possible so we can work something out.

Attendance/Participation: We will have in-class group activities each Tuesday which will be graded for in-class attendance and participation. Each Friday (except days of an exam), we will have some class/group activities after the quiz which will also be graded for attendance and participation. We may occasionally need to change days around or have an activity on another day. If that happens, I’ll try to announce the change as early as I can.

If you miss 1–2 activity days, you can make it up by having extra class contributions (see below). If you will miss 3 or more activity days, please let me know as soon as possible so we can work something out. Making these up is possible for illness, emergencies, school activities, or occasional other days.

Class Contributions: During the semester, we’ll have many opportunities for you to contribute a typed solution (to a homework or activity problem, etc) to our class solutions documents, or to present/lead a solution in class. Please note, you don’t have to present in class if you don’t want to — you can contribute written solutions instead. These class contributions are meant to be collaborative processes, not an exam. The goal is to practice mathematical communication. If you present, you are leading and facilitating the

group. It's okay if you get stuck, and we can all help and contribute ideas!

To get full credit in this category, you'll be asked to make 1 contribution and peer review 3 contributions every two weeks. We'll go over the details during the first day of the semester.

Midterm Exams: We will have two midterm exams, on Friday June 13 and Friday July 11. Each midterm will include material covered in class through the previous week, approximately. Exams will be taken during our normal class time. You will work individually on the exam. You can bring a sheet (letter or A4 size) with notes written on both sides. We'll have some scheduled review time in class and out of class before each exam. No calculators or electronics will be allowed on the exams.

Final Exam: We will have a comprehensive final exam on Friday August 1, from 7:30–9:30am in our normal room. The final exam will have more emphasis on the material covered after Midterm 2. We'll plan on reviewing in class before the final, and we'll have some review time scheduled outside of class.

Late Work: Please note that homework cannot usually be turned in late, since we may go over solutions shortly after the deadline, and to prevent placing extra burden on our homework grader. There will not generally be any makeup quizzes. Instead, the lowest homework score and quiz score will be dropped. If you have an illness, emergency, or school activity come up during the semester, please let me know as soon as possible and we can work something out. Exams must be taken during the scheduled times, except for documented emergencies, illness, or university activities. Please let me know as soon as possible if you won't be able to take an exam at the scheduled time.

Class Streaming / Recordings: I will stream our class sessions on Zoom and post the recordings on Canvas under the Zoom tab. Rarely, there may be a day where Zoom or the campus WiFi is out and the Zoom stream and recording won't be available.

Please note, attendance is generally required on Tuesdays and Fridays (and occasionally we may move days around). I encourage you to also attend in person when you can on Mondays and Wednesdays, but Zoom can be a good option for these days when you can't attend. Zoom won't work so well for Tuesdays and Fridays since we're doing group activities, but certain parts like presentations may be able to be recorded.

If you will have consistent attendance conflicts (particularly with Tuesdays or Fridays), please let me know so we can work something out.

Additional Class Policies

- I aim for our classroom to be a respectful, inclusive environment where we acknowledge that mistakes are an essential part of learning. I thank you for your help in building this learning environment that will benefit all of us. I also welcome any comments and suggestions you have about our class.
- All class materials and announcements will be posted on Canvas, so please make sure to either check Canvas regularly, or have Canvas notifications and messages forwarded to an email that you check frequently.
- You can set your name and pronouns in Canvas, and I will ask at the beginning of the semester what name and pronouns you would like me to use for you in our class.
- Please make sure you do your best throughout the semester, knowing the grading scheme and what's expected of you, and talk to me if you need further study strategies. I am happy to brainstorm ideas to help you maximize your study strategies and improve your mathematical understanding. No extra credit will be provided at the end of the course, so please talk with me early on about any concerns with your grade, so we have time to address them.

- If you have crisis-level extenuating circumstances which affect your class performance, and you need guidance/advice/flexibility, please communicate with me as soon as possible so I can help you in some manner, which I'm truly happy to do. The longer you wait to communicate with me, the less I can do to help.
- If you want to appeal the grading of course component, I ask that you please bring it to me within one week of it being returned. For the final exam, please look over the grading and let me know about any issues within one day of the exam being returned. This policy helps me maintain consistency in grading and helps make sure I can address any grading issues before the final grades are submitted. I'm always happy to look over any classwork with you, answer any questions you have, and fix any grading issues when appropriate.
- It is possible during the semester that I may need to modify this syllabus to help meet the learning goals of our class. If I do need to make any changes, I will announce them on Canvas.

Important Dates: We will meet for class every Monday, Tuesday, Wednesday, and Friday except for these days:

Monday, May 26 (Memorial Day)

Monday, June 16 (Juneteenth observed)

Friday, July 4, (Independence Day)

Important Dates:

Last day to add, drop, or elect Credit/No Credit	.....	Wednesday, May 21
Midterm 1	.....	Friday, June 13
Last day to withdraw	.....	Friday, June 20
Midterm 2	.....	Friday, July 11
Last day to reverse Credit/No Credit	.....	Friday, July 25
Final Exam	.....	Friday, August 1, 7:30–9:30am

Tentative Schedule:

Week 1 (May 12–16) Logic and Proofs; 1.1–1.2

Week 2 (May 19–23) 1.3–1.5

Week 3 (May 27–30) 2.1–2.3

Week 4 (June 2–6) 2.4–2.6, 3.1

Week 5 (June 9–13) 3.1, Review, Midterm 1

Week 6 (June 17–20) 3.2–3.4

Week 7 (June 23–27) 4.1–4.3

Week 8 (June 30–July 3) 4.4, 5.1–5.2

Week 9 (July 7–11) 5.3, Review, Midterm 2

Week 10 (July 14–18) 5.4, 6.1–6.2

Week 11 (July 21–25) 6.3–6.5

Week 12 (July 28–August 1) Review, Final Exam: Friday, August 1, 7:30–9:30am

Note: This is an approximate schedule, and I may need to adjust the pace for the learning needs of our class.

University of Utah Policies:

Belonging Statement: I stand in support of compassion, dignity, value-of-life, fair treatment, belonging, and justice for all individuals regardless of color, race/ethnicity, sexual orientation, religion, language, socioeconomic status, ability, gender, gender identity or expression, immigration status, or any type of marginalization. I stand in support of making our society more fair and compassionate for all individuals. I stand against discrimination in all its various forms.

Math Tutoring Center: Please do not hesitate to come to office hours or contact me with any questions you have or to discuss anything about the course. Additionally, the T. Benny Rushing Mathematics Tutoring Center offers free online tutoring. The website can be found here: <https://www.math.utah.edu/undergrad/mathcenter.php>

Private Tutoring: The Learning Center has additional tutoring available for our class. Their website can be found here: <https://learningcenter.utah.edu/>
The math department also maintains a list of private tutors.

Student Names and Personal Pronouns: Class rosters are provided to the instructor with the students' legal name as well as preferred first name (if previously entered by you in the Student Profile section of your CIS account). While CIS refers to this as merely a preference, I will honor you by referring to you with the name and pronoun that feels best for you in class, on papers, exams, group projects, etc. Please advise me of any name or pronoun changes (and update CIS), so I can help create a learning environment in which you, your name, and your pronoun will be respected.

Discrimination and Harassment: If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801-581-8365, or Office of the Dean of Students, 270 Union Building, 801-581-7066. To report to the police, contact the Department of Public Safety, 801-585-2677 (COPS). Please see Student Bill of Rights, section E <http://regulations.utah.edu/academics/6-400.php>. I will listen and believe you if someone is threatening you.

Learners of English as an Additional/Second Language: If you are an English language learner, please be aware of several resources on campus that will support you with your language and writing development. These resources include: the Writing Center (<http://writingcenter.utah.edu/>); the Writing Program (<http://writing-program.utah.edu/>); the English Language Institute (<http://continue.utah.edu/eli/>). Please let me know if there is any additional support you would like to discuss for this class.

Undocumented Student Support: Immigration is a complex phenomenon with broad impact—those who are directly affected by it, as well as those who are indirectly affected by their relationships with family members, friends, and loved ones. If your immigration status presents obstacles to engaging in specific activities or fulfilling specific course criteria, confidential arrangements may be requested from the Dream Center. Arrangements with the Dream Center will not jeopardize your student status, your financial aid, or any other part of your residence. The Dream Center offers a wide range of resources to support undocumented students (with and without DACA) as well as students from mixed-status families. To learn more, please contact the Dream Center at 801-213-3697 or visit www.dream.utah.edu.

Veterans Center: If you are a student veteran, the University of Utah has a Veterans Support Center located in Room 161 in the Olpin Union Building. Hours: M-F 8:00am – 5:00pm. Please visit their website for more information about what support they offer, a list of ongoing events and links to outside resources:

<http://veteranscenter.utah.edu/>. Please also let me know if you need any additional support in this class for any reason.

Campus Safety: The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit safeu.utah.edu

Crisis Services Center: This center offers services Mo-Fr 8 am - 5 pm. If you would like to talk to one of the staff members, please call 801-581-6826 or walk into the Center at 426 Student Services Building (SSB). For more urgent situations and after hours, please go to the University Neuropsychiatric Institute (UNI), 501 Chipeta Way, or to the Emergency Department at the University Hospital. UNI Crisis Line: 801-587-3000 offers crisis response 24/7, including: crisis support over the phone, a mobile outreach option (MCOT) that will respond to persons in their home, and the Receiving Center where individuals from Salt Lake County can access a safe and supportive environment to help individuals work through their crisis situation. Individuals may spend up to 23 hours at the Receiving Center, at no cost.

Student Success Advocates: <https://ssa.utah.edu/> The mission of Student Success Advocates is to support students in making the most of their University of Utah experience (ssa.utah.edu). They can assist with mentoring, resources, etc. Any student who faces challenges securing their food or housing and believes this may affect their performance in the course is urged to contact a Student Success Advocate for support (<https://asuu.utah.edu/displaced-students>).

University Counseling Center: The UCC staff is committed to supporting the mental health needs of our campus community. Their phone number is 801-581-6826. Their hours are Monday-Friday, 8:00am-5:00pm. For after-hours emergencies, contact the 24/7 Crisis Line: 801-587-3000 . More information is at <https://counselingcenter.utah.edu/> .

Office of the Dean of Students: The Office of the Dean of Students is dedicated to being a resource to students through support, advocacy, involvement, and accountability. It serves as a support for students facing challenges to their success as students, and assists with the interpretation of University policy and regulations. To contact the Office of the Dean of Students, please email deanofstudents@utah.edu or call 801-581-7066. There is more information at <https://deanofstudents.utah.edu/> .

Center for Student Wellness: Personal concerns such as stress, anxiety, relationship difficulties, depression, cross-cultural differences, etc., may interfere with a student's ability to succeed and thrive at the University of Utah. For helpful resources, contact the Center for Student Wellness: <https://wellness.utah.edu/>

Americans With Disabilities Act (ADA): The University of Utah seeks to provide equal access to its programs, services, and activities for people with disabilities. If you will need accommodations in this class, reasonable prior notice needs to be given to the Center for Disability & Access, 162 Olpin Union Building, (801) 581-5020. CDS will work with you and the instructor to make arrangements for accommodations. All written information in this course can be made available in an alternative format with prior notification to the Center for Disability & Access.

In compliance with ADA requirements, some students may need to record course content. Any recordings of course content are for personal use only, should not be shared, and should not be made publicly available. In addition, recordings should be destroyed at the conclusion of the course.

Addressing Sexual Misconduct: Title IX makes it clear that violence and harassment based on sex and gender (which includes sexual orientation and gender identity/expression) is a civil rights offense subject to the same kinds of accountability and the same kinds of support applied to offenses against other protected categories such as race, national origin, color, religion, age, status as a person with a disability, veterans status or genetic information. If you or someone you know has been harassed or assaulted, you are encouraged to report it to the Title IX Coordinator in the Office of Equal Opportunity and Affirmative Action, 135 Park Building, 801- 581-8365, or the Office of the Dean of Students, 270 Union Building, 801-581-7066. For support and confidential consultation, contact the Center for Student Wellness, 426 SSB, 801-581-7776. To report to the police, contact the Department of Public Safety, 801-585-2677(COPS).

Faculty and Student Responsibilities: All students are expected to maintain professional behavior in the classroom setting, according to the Student Code, spelled out in the Student Handbook. Students have specific rights in the classroom as detailed in Article III of the Code. The Code also specifies proscribed conduct (Article XI) that involves cheating on tests, plagiarism, and/or collusion, as well as fraud, theft, etc. Students should read the Code carefully and know that they are responsible for the content. According to Faculty Rules and Regulations, it is the faculty's responsibility to enforce responsible classroom behaviors, beginning with verbal warnings and progressing to dismissal from class and a failing grade. Students have the right to appeal such action to the Student Behavior Committee. See <http://regulations.utah.edu/academics/6-400.php>

Academic Misconduct Statement: It is expected that students adhere to University of Utah policies regarding academic honesty, including but not limited to refraining from cheating, plagiarizing, misrepresenting one's work, and/or inappropriately collaborating. This includes the use of generative artificial intelligence (AI) tools without citation, documentation, or authorization. Students are expected to adhere to the prescribed professional and ethical standards of the profession/discipline for which they are preparing. Any student who engages in academic dishonesty or who violates the professional and ethical standards for their profession/discipline may be subject to academic sanctions as per the University of Utah's Student Code: <https://regulations.utah.edu/academics/6-410.php>

Safety Statement: The University of Utah values the safety of all campus community members. To report suspicious activity or to request a courtesy escort, call campus police at 801-585-COPS (801-585-2677). You will receive important emergency alerts and safety messages regarding campus safety via text message. For more information regarding safety and to view available training resources, including helpful videos, visit <https://safeu.utah.edu>

Disclaimer: This syllabus is meant to serve as an outline and guide for our course. During the semester, I may need to adjust this syllabus or the course schedule to accommodate the needs of our class. Any changes will be announced in class and posted on Canvas.