Vincent Vatter
Department of Mathematics

Real Analysis 1 F22

MAA 4211 Real Analysis and Advanced Calculus 1

University of Florida, Fall 2021

Norman Hall 1001, MWF5 (11:45–12:35)

Instructor information:

Vince Vatter

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Office hours: tba
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Very tentative schedule

(But the dates of assignments are unlikely to change.)

Lec	Date	Topics
1	Wednesday 8/24	Introduction and $\sqrt{2}$ Section 1.1
2	Friday 8/26	Sets, functions, and proofs Section 1.2
3	Monday 8/29	The axiom of completeness (suprema and infima) Section 1.3
4	Wednesday 8/31	Consequences of completeness Section 1.4 **Homework 1** due before class
5	Friday 9/2	Cardinality Section 1.5
	Monday 9/5	*Labor day (no class)*
6	Wednesday 9/7	Introduction to sequences and series Section 2.1

		Homework 2 due before class
7	Friday 9/9	Limits of sequences
		Section 2.2
8	Monday 9/12	Limit theorems
		Section 2.3
	Wednesday 9/14	**Exam 1** during class
9	Friday 9/16	Limit theorems, continued
		Section 2.3
10	Monday 9/19	Monotone sequences
		Section 2.4
11	Wednesday 9/21	Subsequences
		Section 2.5
		Quiz 1 due on Canvas
12	Friday 9/23	Bolzano–Weierstrass
		Section 2.5
13	Monday 9/26	Cauchy sequences
		Section 2.6
14	Wednesday 9/28	Numerical series
		Section 2.7
		Homework 3 due before class
15	Friday 9/30	tba
16	Monday 10/3	The Cantor set
		Section 3.1
17	Wednesday 10/5	Open and closed sets
		Section 3.2
		Quiz 2 due on Canvas
	Friday 10/7	*Homecoming (no class)*
18	Monday 10/10	Open and closed sets, continued
		Section 3.2
	Wednesday 10/12	**Exam 2** during class
19	Friday 10/14	Sequential compactness (but not open covers)
		Section 3.3
20	Monday 10/17	Limits of functions
		Section 4.2
21	Wednesday 10/19	Continuous functions
		Section 4.3
		Quiz 3 due on Canvas
22	Friday 10/21	tba
23	Monday 10/24	Continuous functions on compact sets
		Section 4.4
24	Wednesday 10/26	The intermediate value theorem
		Section 4.5
		Homework 4 due before class
25	Friday 10/28	Derivatives and the intermediate value property
		Section 5.2
26	Monday 10/31	The mean value theorems (but not L'Hôpital's rule)
		Section 5.3
	Wednesday 11/2	**Exam 3** during class

27	Friday 11/4	A continuous nowhere-differentiable function
		Section 5.4
28	Monday 11/7	Uniform convergence of sequences of functions
		Section 6.2
29	Wednesday 11/9	Uniform convergence and differentiation
		Section 6.3
		Quiz 4 due on Canvas
	Friday 11/11	*Veterans Day (no class)*
30	Monday 11/14	Introduction to integration
		Section 7.1
31	Wednesday 11/16	The Riemann integral
		Section 7.2
		Homework 5 due before class
32	Friday 11/18	The Riemann integral, continued
		Section 7.2
33	Monday 11/21	Integrating functions with discontinuities
		Section 7.3
	Wednesday 11/23	*Thanksgiving break (no class)*
	Friday 11/25	*Thanksgiving break (no class)*
34	Monday 11/28	Properties of the integral
		Section 7.4
	Wednesday 11/30	**Exam 4** during class
35	Friday 12/2	The fundamental theorem of calculus
		Section 7.5
36	Monday 12/5	Thomae's function and integrability
		Sections 7.6 and 4.1
37	Wednesday 12/7	Lebesgue's theorem on Riemann-integrability
		Section 7.6
		Quiz 5 due on Canvas

Text

Abbott's *Understanding Analysis*, 2th edition.

Course content

Advanced treatment of limits, differentiation, integration and series.

In addition to mastery of the course content, course objectives include reading, writing, and discovering proofs and constructing proofs and counterexamples in analysis.

Expectations and grading rubric

Work submitted for a grade in this course will be graded in a most rigorous fashion, and should be prepared with a good deal of thought and care.

Most of the work required in this course will consist of writing proofs. For a problem worth 10 points, scores will be based on the following guidelines.

0 points.

The work contains no original steps toward a correct solution. This includes work that simply consists of relevant definitions or theorems without interpretation.

3 point.

The work contains some original steps toward a correct solution but does not contain a workable outline of the full solution. This grade is also used if the student has misunderstood the question or made an unwarranted simplifying assumption that makes the problem trivial.

6 points.

The work contains an outline of a correct solution and several steps toward this solution. However, the writing may be unclear, or there may be holes in the argument.

8 points.

The work is resembles a full, complete proof, but it has some serious deficiencies. These may include incomplete sentences, abbreviating words with logical symbols such as those for "for all" or "implies", imprecise definitions, or overlooking trivial cases. In general this grade is reserved for work which would receive 4 points with minor revision.

10 points.

The work consists of a full, complete proof and is reasonably well written in complete sentences, without logical symbols. There may be minor typos or clumsy writing that could be improved, but no important steps of the solution are omitted or incorrect.

Evaluation

There will be **4 exams**, **5 homework assignments**, and **5 quizzes** throughout the semester, as indicated in the schedule.

The exams will collectively count for 50% of your grade, the homework assignments for 30%, and the quizzes for 20%.

Final letter grades will be assigned on a curve, which will be no tougher than the 10-point scale: 90%–100% will be some form of A, 80–90% will be at least some form of B, etc.

It is currently planned that exams will be in-person in the classroom. Homework will be written, scanned, and submitted through Canvas. Quizzes will be untimed, multiple choice, and on Canvas. Exams will be closed-book without notes. For quizzes and homework assignments, you are encouraged to consult your notes and textbook.

Late assignments will not be accepted except by prior agreement.

If you have a disagreement with the grading of one of your solutions, I ask that you submit a written request for reconsideration within one month.

Grading will be in accordance with the UF policy stated at
https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx.

Honor code

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor

and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: **"On my honor, I have neither given nor received unauthorized aid in doing this assignment."** The Honor Code specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor.

Class attendance

Attendance is strongly encouraged but is not a component of grades.

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

Accommodations for students with disabilities

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

Online evaluations

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

Complaints

The official UF policy for filing a complaint about the course may be found   here .

Counseling and wellness center

https://counseling.ufl.edu/ , 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

U matter, we care

Your well-being is important to the University of Florida. The U Matter, We Care initiative is committed to creating a culture of care on our campus by encouraging members of our community to look out for one another and to reach out for help if a member of our

community is in need. If you or a friend is in distress, please contact umatter@ufl.edu so that the U Matter, We Care Team can reach out to the student in distress. A nighttime and weekend crisis counselor is available by phone at 352-392-1575. The U Matter, We Care Team can help connect students to the many other helping resources available including, but not limited to, Victim Advocates, Housing staff, and the Counseling and Wellness Center. Please remember that asking for help is a sign of strength. In case of emergency, call 9-1-1.

In-class recording

Students are allowed to record video or audio of class lectures. However, the purposes for which these recordings may be used are strictly controlled. The only allowable purposes are (1) for personal educational use, (2) in connection with a complaint to the university, or (3) as evidence in, or in preparation for, a criminal or civil proceeding. All other purposes are prohibited. Specifically, students may not publish recorded lectures without the written consent of the instructor.

A "class lecture" is an educational presentation intended to inform or teach enrolled students about a particular subject, including any instructor-led discussions that form part of the presentation, and delivered by any instructor hired or appointed by the University, or by a guest instructor, as part of a University of Florida course. A class lecture does not include lab sessions, student presentations, clinical presentations such as patient history, academic exercises involving solely student participation, assessments (quizzes, tests, exams), field trips, private conversations between students in the class or between a student and the faculty or lecturer during a class session.

Publication without permission of the instructor is prohibited. To "publish" means to share, transmit, circulate, distribute, or provide access to a recording, regardless of format or medium, to another person (or persons), including but not limited to another student within the same class section. Additionally, a recording, or transcript of a recording, is considered published if it is posted on or uploaded to, in whole or in part, any media platform, including but not limited to social media, book, magazine, newspaper, leaflet, or third party note/tutoring services. A student who publishes a recording without written consent may be subject to a civil cause of action instituted by a person injured by the publication and/or discipline under UF Regulation 4.040 Student Honor Code and Student Conduct Code.