MATH 3001 - Fall 2020
Real Analysis

Instructor: Jason Crann
Office Hours: TBD
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Course Dates: Sep. 09, 2020 – Dec. 11, 2019.
Lectures: Pre-recorded lectures along with lecture notes will be posted on cuLearn by the scheduled class time: Tuesday/Thursday 13:05.
Tutorials: Pre-recorded tutorial style lectures along with tutorial notes will be posted on cuLearn by the scheduled tutorial time: Tuesday 16:35.
TA: Anna Gow (annagow@cmail.carleton.ca)

Representative Textbook: *Real Analysis*, by N. L. Carothers. Same textbook used for MATH 3002, and a great analysis reference to have on the shelf.

Evaluation:

- Assignments - 30%;
- Tests - 30%;
- Final Exam - 40%.

There will be 3 assignments and 3 tests during the semester (alternating every 2 weeks). All tests will be administered through cuLearn. You will be given a list of questions and a time limit to upload your scanned solutions. The final exam, to be scheduled by the University, will be administered similarly to the tests.

Possible Scanning Apps:

- CamScanner;
- TapScanner;
- Adobe scanner.

CamScanner has gotten favourable reviews amongst some Carleton instructors, and it has been used successfully in my previous online courses. Adobe scanner can be installed on mobile phones and it links your scanned items (as a PDF) to your Adobe Reader account on your PC and saves them in the cloud.

Prerequisites: MATH 2000 with a grade of C- or higher; or MATH 3009 and MATH 1800 each with a grade of B or higher, and permission of the instructor; or permission of the School.

Approximate Course Description:

- Review of $\mathbb{R}$: monotone convergence, completeness.
- Basic set theory: set operations, mappings, cardinality.
- Metric and normed spaces: general framework, ℓ^p spaces, $C_b(\mathbb{R})$, product spaces.

- Basic topology: convergence, open and closed sets, density, Weierstrass approximation theorem.
- Continuity: space of continuous functions on a metric space, equivalent metrics and homeomorphisms.
- Connectedness: disconnections, the intermediate value theorem.
- Completeness: total boundedness, contraction mapping principle, applications to differential equations, completions.
- Compactness: fundamental characterizations, extreme value theorem, equivalence of norms in finite dimensions.

Course Goals: The primary goal is to upgrade one's understanding of basic concepts from calculus to the level of metric spaces, while at the same time developing one's proficiency in mathematical proof. The secondary goal is to introduce students to certain advanced topics in analysis with applications to approximation theory, differential equations and fractal geometry.

Requests for Academic Accommodation: You may require special arrangements to meet your academic obligations during the term. For an accommodation request, the processes are as follows:

- **Pregnancy obligation:** Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf
- **Religious obligation:** Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. For more details, visit the Equity Services website: carleton.ca/equity/wp-content/uploads/Student-Guide-to-Academic-Accommodation.pdf
- **Academic Accommodations for Students with Disabilities:** If you have a documented disability requiring academic accommodations in this course, please contact the Paul Menton Centre for Students with Disabilities (PMC) at 613-520-6608 or pmc@carleton.ca for a formal evaluation or contact your PMC coordinator to send your instructor your Letter of Accommodation at the beginning of the term. You must also contact the PMC no later than two weeks before the first in-class scheduled test or exam requiring accommodation (if applicable). After requesting accommodation from PMC, meet with your instructor as soon as possible to ensure accommodation arrangements are made. carleton.ca/pmc
- **Survivors of Sexual Violence:** As a community, Carleton University is committed to maintaining a positive learning, working and living environment where sexual violence will not be tolerated, and is survivors are supported through academic accommodations as per Carleton's Sexual Violence Policy. For more information about the services available at the university and to obtain information about sexual violence and/or support, visit: carleton.ca/sexual-violence-support

- **Accommodation for Student Activities:** Carleton University recognizes the substantial benefits, both to the individual student and for the university, that result from a student participating in activities beyond the classroom experience. Reasonable accommodation must be provided to students who compete or perform at the national or international level. Please contact your instructor with any requests for academic accommodation during the first two weeks of class, or as soon as possible after the need for accommodation is known to exist. https://carleton.ca/senate/wp-content/uploads/Accommodation-for-Student-Activities-1.pdf
- **Deferred Exam:** Students who miss the final exam may be eligible for a deferral. Application for a deferral must be made, with appropriate documentation, to the Registrar's Office within five business days of the examination.