MAT137Y1Y: Calculus with proofs

University of Toronto.   Fall 2020-Winter 2021 Course Outline

Welcome to MAT137! This course has four objectives:

1. **Calculus concepts.** We want you to become fluent in various concepts in calculus (limits, derivatives, integrals, sequences, and series) and their applications to math and science. This includes learning to compute with them, and learning the most important theorems that deal with them,

2. **Mathematical rigour.** We will introduce you to mathematical logic. We want to make you comfortable with reading and understanding mathematical statements and precise definitions, and with reading, critiquing, and writing rigorous proofs.

3. **Problem solving.** In your future career, we would like you to be able to attack new problems that you have never seen before, to figure out by yourself how to adjust old methods to new situations, and to learn how to be confident with your answers. You will achieve this not by memorizing a lot of formulas and methods, but by understanding why they work and by coming up with them by yourself.

4. **Academic integrity.** University life requires respecting academic integrity. This includes being honest and fair, honouring the trust that is placed on you, taking responsibility for your actions, and never using other's work as your own. You will uphold these values in this course.

We wish you a productive and rewarding year, and we look forward to working with you. Thanks!

The MAT137 team:

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For administrative questions, please email **admin137@math.toronto.edu**

Note: Due to the unusual current circumstances, all aspects of the course, including assessments, may change. We will inform you of any changes on the course website and via an announcement on Quercus. Any decisions made by the course coordinator regarding these changes will be final.

Course sites

- **Course website:** uoft.me/MAT137. You are responsible for checking it regularly. We will post all course materials on it, including links to videos, schedule, practice problems, office hours, assignments, test information, et cetera.

- **Quercus.** We will use Quercus to post announcements. By default, you should get an email every time an announcement is posted, as long as your utoronto email address is correct on Quercus. You can also always read old announcements by logging in. In addition, we will use Quercus to post grades.

Technology needs

Please review the minimal technical requirements that the University has identified you will need for online teaching and learning. In addition:

- You will need a scanner to submit your assignments and tests. Alternatively, you can use your phone camera to take an upload images, but you are responsible for making sure they are legible. If you are going to use your phone, we recommend you download a free scanning app (such as scanbot or camscanner), as the quality will be much better.

- You will need a microphone to participate in class.

- When you attend office hours, you will need to turn on your microphone, and you will need to show your work. You can do this by scanning it, uploading an image from your phone, sharing a camera, or sharing a screen, for example.

The components of the course

What we assume you already know

One of the most common reasons for failure in calculus is a weak background in precalculus. To help you, our department has prepared the website

uoft.me/precalc

This site contains a summary of the topics we expect you to have learned in high school. There are self-diagnostic quizzes you can take, as well as worked examples and practice problems. We will not review this material in class. We expect you to review it by yourself and to work on any practice problems you need. You may of course ask any questions during office hours or on piazza.

Videos

We have created short YouTube videos to introduce you to the basics of each concept. We expect you to watch them before each class, so we can start each day doing meaningful practice. Attending class without watching the videos will be a waste of your time.

The videos are linked from the course website.

Classes

You have three weekly hours of class. They are called "lectures" at UofT, but we won't be lecturing much (that is what the videos are for!). Instead, you will spend class time working on problems and conceptual questions with each other and with our help. We won't record classes. We will post the questions we use in class, but no solutions or anything else. The point of class is for you to actively engage with the material, not to watch or read somebody else's solutions.

You will need to attend class for the section you are enrolled in. If you wish to attend a different section, change your enrolment first.

Practice problems

The website contains a collection of practice problem for each unit, with some answers and hints, for you to practice in your own time.

Textbook

We do not require a textbook in this course. The videos and practice problems are enough.

Nevertheless, those who prefer a traditional textbook, and those who want more examples or a bigger collection of practice problems, may use "Calculus in One Dimension, Vol 1 and 2" by Tyler Holden. It is based on the lecture notes of a former MAT137 instructor, and you may purchase it at the UofT Bookstore.

Assignments

This is where you really solidify your understanding and develop your skills. After getting the basics from videos, and after practicing in class and with practice problems, you are ready to tackle more challenging tasks in assignments. We design them to take you a longer time and to force you to think deeply. Often you will be exploring new questions that we have not taught you, as this is one of the

objectives of the course. You will submit assignments electronically and they will be marked. You may complete assignments alone or in a team of two students. See the course website for details.

The tentative deadlines for the assignments are

- A1: Thu, 1 Oct 2020
- A2: Thu, 15 Oct 2020
- A3: Thu, 5 Nov 2020
- A4: Thu, 26 Nov 2020
- A5: TBA

- A6: Thu, 21 Jan 2021
- A7: Thu, 11 Feb 2021
- A8: Thu, 25 Feb 2021
- A9: Thu, 18 Mar 2021
- A10: Thu, 1 Apr 2021

Both the number of assignments and the deadlines may be subject to change. We will announce any changes with plenty of time on the course website and on Quercus.

How much can you collaborate on assignments? Discussing exercises (including graded homework problems) with your classmates is a useful and mathematically healthy practice. However, when it comes time to write up your solutions for submission, *you must work independently* (or, in this course, with your one teammate if you choose to submit together). **Please read "Important notes on collaboration"** on the "Assignments" tab of the course website for more details on what is acceptable collaboration and what constitutes academic misconduct. If in doubt, ask us. You will never get in trouble for asking if a type of collaboration is acceptable.

Tests

We plan to have five tests in the course. Tests are easier than assignments, but you have a limited amount of time and you have to complete the work entirely by yourself. You can consult the course materials during the tests (for example, your notes, the videos, or the practice problems) but you cannot consult with anybody else or use any other internet resource. The best way to get ready for tests it to watch all the videos, complete all the practice problems, and review the assignments.

You will complete all tests online. You will have a limited amount of time to complete each test, but there will be a 24-hour period for you to decide when your time starts. This is to accommodate those in other time zones. There will be a "Practice Test" before Test 1 to get you used to the software and the format. There will be more information on the course website.

The tentative test dates are

- Test 1: Fri, 23 Oct 2020
- Test 2: Fri, 4 Dec 2020
- Test 3: Fri, 29 Jan 2020

- Test 4: Fri, 5 Mar 2020
- Test 5: during April's final-exam period

Both the number of tests and the dates may be subject to change. We will announce any changes with plenty of time on the course website and on Quercus.

Piazza

We have an online forum on Piazza for students to talk to each other. You can ask questions, discuss math, form study groups, and generally help each other. Instructors also chime in occasionally. The forum is linked from the course website.

Office hours

There will be a large number of weekly office hours, where you can talk to an instructor or a TA. You can talk to any of us. You do not need an appointment: just show up. If you have a math question, make sure you have spent some time on it first, and be ready to explain what have you attempted so we can help you better.

Some office hours are labelled "Proof Clinic". These are dedicated hours for students who want feedback on their proof writing.

For details, schedule, and how to access office hours online, see the course website.

Academic Integrity

Upholding high standards of Academic Integrity is one of the goals of MAT137. It is impossible to succeed in the course without it. Familiarize yourself with UofT's policies on Academic Misconduct and its consequences.

Accessibility and accommodations

If you require accommodations for a disability, including for testing and testing procedures, please contact Accessibility Services at https://studentlife.utoronto.ca/department/accessibility-services/

Grading scheme

There are 15 assessment pieces in the course (10 assignments and 5 tests). For each student, we will drop the lowest three scores among them, subject to two constraints:

- We will drop at most 2 tests.

- We may drop the last assignment or the last test, but not both.

This will leave us with 12 assessment pieces for each student. They will all carry the same weight. Your course grade will be the average of the 12 scores.

Dropping the lowest 3 scores also accounts for any unexpected events that may prevent you from completing an assessment. We offer this arrangement to all students in lieu of other accommodations. If you miss a test due to illness, accident, or any other emergency, then it is one of the scores we drop. You do not have to request it or reveal any private information to us. As a consequence, **we will not offer any other accommodations, extensions, or make-ups, for any student, for any circumstances.** Do not ask for them.

We have a generous, flexible grading scheme. It allows you to recuperate easily from a bad day. Don't be greedy or entitled: do not ask for more.

Finally, a note about "adjustments". We try to evaluate you in absolute, not relative standards. Your grade should reflect the quality of your work against the learning objectives of the course, not how well you do relative to your peers. If you all do well, there will be a lot more As than usual. If you all do poorly, there will be a lot more Fs than usual. A passing grade in MAT137 should mean that you have a chance of surviving in MAT237, not that you are in a certain percentile of the class. We do not "curve", and we will not adjust grades just because students do well or bad, because they "really need" a certain grade. Do not ask for any additional adjustments: there will be none.