

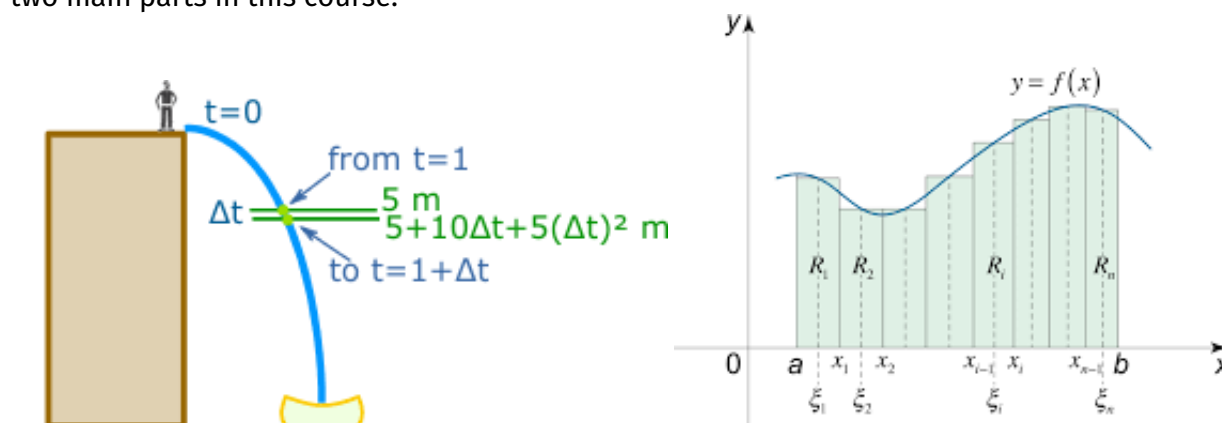
University of Toronto MAT 137Y: Calculus with proofs
Fall 2022– Winter 2023

Syllabus

September 8, 2022

Introduction

The word “Calculus” comes from Latin meaning “small stones”. We learn and understand Calculus by looking at small pieces. Differential calculus cuts something into small pieces to find how it changes and integral calculus joins the small pieces together to find how much there is. We will explore these two main parts in this course.



Welcome to MAT137! This course has four objectives for your growth and development.

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 are creating many learning opportunities in this course: office hours, videos, lectures, tutorials, pre-class quizzes, practice problems, Piazza, problem sets, and tests. Take advantage of all of them! We are excited to support your learning experience so talk to us at any time. We wish you a productive and rewarding year.

1 Contact

1.1 Teaching Team

You can find a complete list of the teaching team including instructors and TAs on [Quercus](#). Here is a list of instructors.

Section	Instructor	Email
LEC 0101	Xiaoyue Cui (Coordinator)	xcui@math.toronto.edu
LEC 0102	Abdalrazzaq Zalloum	abdul.zalloum@utoronto.ca
LECo201	Ilia Gaiur	ilia.gaiur@utoronto.ca
LEC 0301	Tomas Kojar (Fall)	tomas.kojar@mail.utoronto.ca
	Debaditya Raychoudry(Winter)	draychau@fields.utoronto.ca
LEC 0401	Tomas Kojar (Fall)	tomas.kojar@mail.utoronto.ca
	Debaditya Raychoudry(Winter)	draychau@fields.utoronto.ca
LEC 0501	Jason Siefken	siefkenj@math.toronto.edu
LEC 0601	Boris Khesin	khesin@math.utoronto.ca
LEC 5101	Daniel Alvarez	dalv@math.toronto.edu

You must email us from your [@mail.utoronto.ca](#) account and you must follow [basic email etiquette](#).

Otherwise, your email will be automatically deleted. Email is reserved for administrative questions. **Please include “MAT137” on the subject of any email you send to us.**

1.2 Questions

- **Mathematics:** Post on [Piazza](#), or talk to course material during [office hours](#).
- **Course advice:** Post on [Piazza](#) or email your instructor.
- **Course administration:** First, read this syllabus carefully. Second, search the [announcements](#). Third, read the frequently updated [Policies and FAQ](#) on Quercus. If you have searched these sources and cannot find the answer to your question, then email admin137@math.toronto.edu.
- **Academic Integrity:** Contact our course staff [Wendy Liu](#).
- **Accessibility:** If you require accommodations for a disability, or have any accessibility concerns about the course, the classroom, or course materials, please contact [Accessibility Services](#) as soon as possible.
- **University life:** Please contact your [college registrar](#) for almost any aspect of your university life, especially if you are experiencing any academic, personal, or financial struggles.

1.3 Health and wellness

The [Health and Wellness Center](#) provides a range of services for your physical and mental health, wellness programs, and information to help support you in achieving your personal and academic goals. We encourage you to explore their offerings and build health habits.

If you are searching for immediate and/or ongoing confidential support for any school, health, or general life concern then please call [U of T MySSP](#) at 1-844-451-9700 (or 001-416-380-6578 for outside North America). This service is free and available 24 hours a day in many languages.

2 Course Platforms

- [Quercus](#) is your MAT137 homepage. You are responsible for checking it regularly. We will post on it all official announcements, logistics, deadlines and course materials, including office hours, problem sets, and test information. Grades for pre-class quizzes will be posted on Quercus. However, grades for tutorial worksheets, problem sets and tests can only be viewed on Gradescope; these will not be synced with Quercus. 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. This email should be the same as the one for Quercus (<https://q.utoronto.ca/profile/settings>).
- [Mathmatize](#) is your MAT137 lecture activity software. It is free for you and you don't need to install anything in advance on your laptop or cellphone. You will explore questions collaboratively and get instant feedback. No account is needed and none of these activities are graded.
- [Piazza](#) is your MAT137 discussion forum. It is free for you. You can use it to meet other MAT137 students, ask questions, discuss problems, make study groups, and in general help each other. Instructors and TAs will moderate the forum.
- [GradeScope](#) is your MAT137 grading and submission software for tutorial worksheets, problem sets and tests. Log in to the **Canadian** server only (www.gradescope.ca). Do not use the .com server. This is the place you will submit your tutorial worksheets and problem sets. Your TAs will also mark all your tutorial worksheets, problems sets and exams here. Your @mail.utoronto.ca account will be automatically signed up for a free account when you are assigned your first problem set. Check more details about [Gradescope FAQ](#) under "Start Here" module of the course page on Quercus. Browse their [help centre](#) for technical support.
- [Zoom](#) is your MAT137 platform for online learning, if required. You must sign up for a free Zoom account with your [@mail.utoronto.ca](#) account for security purposes. We strongly recommend that you install the [Zoom desktop client](#) or app.

3 Resources

3.1 Textbook

There is no official textbook for 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. You can use:

- "*Calculus in One Dimension*" by Tyler Holden. Volume 1. 2018 updated edition.
- "*Calculus in One Dimension*" by Tyler Holden. Volume 2. 2018 edition. ([errata](#))

Volume 1 2018 updated edition contains many corrections compared to the original edition. You can still use the original one and use the list of [errata](#) to check any potential errors.

The book is a set of lecture notes written by a former MAT137 instructor. It is much cheaper than a regularly published textbook, and it is better suited for us. You may buy it at the UofT bookstore.

Notice that the textbook sometimes may go in more depth, or provide more examples, or emphasize different concepts, so it is a great source to complement videos and lectures when you are confused.

3.2 Equipment & Technology

The Vice-Provost has outlined [basic technology requirements for online learning](#). For any online activities, you will need a webcam, microphone, headphones, computer, and a strong reliable internet connection. To submit problem sets, you will need a digital writing tablet or access to a printer. Please email admin137@math.toronto.edu immediately if you are concerned about meeting any of these technology requirements. Read the [Policies and FAQ](#) on Quercus for further details.

3.3 Practice problems and suggested textbook problems

We will post practice problems and suggested textbook problems for you to practice. We encourage you to work through them as we cover the sections in class. These are good resources that you can use to prepare your problem sets and tests. You can always visit us during office hour or use Piazza for help. These practice problems won't be turned in.

4 Support

4.1 Office hours

For math-related questions, you are welcome to talk to any of us in-person; you are not restricted only to your lecturer. For our office hours and locations, please check the [office hour calendar](#) on Quercus, as they will likely change. You do not need an appointment to come during our regularly scheduled office hours. If you cannot make any of our office hours, ask us for an appointment by email or by talking to us at the end of a lecture. We are always happy to talk to students!

4.2 Math Learning Center

At the MLC, you can drop-in and:

- Find space to work on problem sets.
- Collaborate with other 137 students.
- Ask math questions to any TA. Certain hours have TAs with 137 expertise.

The MLC serves many different MAT courses and has daily regular hours. Other college-specific MLCs can be found [here](#). The MLC also holds online TA office hours in the evenings and weekends. A TA will answer your questions via video chat but you will not need to share audio or video. More details will be posted on the course site.

4.3 Pre-Calculus Review Material

One of the most common reasons for failure in calculus is a weak background in precalculus. To help you with this, we have a “Pre-Calculus Review Material” module on our [Quercus Course Page](#) for you to review some topics we expect you to have learned in high school. It contains a [precalculus preparation website](#) which is developed by our math department and a [trig function review](#) page.

We will not review these material in class. We expect you to review them by yourself and work on the practice problems by the end of the second week of class. **Ignoring this material or letting it go past the second week will make it very difficult to succeed in this course.** You may of course ask any questions to instructors or TAs during office hours. You may also use Piazza to ask other students.

5 The MAT137 Learning Circle

Complete pre-class essentials

Hours/week: 1+

We have short YouTube videos that contain short summaries of the main concepts throughout the course. They are linked from the course page on Quercus. Your instructor will tell you which videos to watch before each lecture. We expect you to watch them before each class and **complete one short pre-class quiz**, so we can start each day doing meaningful practice. This way, we don't have to waste time on copying down definitions or performing rote computations. If there's something you don't understand in the videos, you should ask about it on Piazza before class. Coming to lecture without having watched the corresponding videos and completing the pre-class quiz will be a waste of time. It is recommended to plan ahead and put time for this into your weekly schedule.

Participate in lectures

Hours/week: 3

You have three weekly hours of class. They are called "Lectures" at UofT, but there won't be a lot of actual "lecturing" on the lecture sections (that is what the videos are for!). We will expect you to have watched some short videos and take your own notes before coming. You will spend class time working on difficult, conceptual questions and discussing them with your peers.

Collaborate in tutorials

Hours/week: 1

In addition to lectures, you will have one hour of tutorial per week, on Tuesday or Wednesday. Each week we will select a topic that is particularly important or that we know students struggle with, and you will have the opportunity during tutorial to get very useful practice and to get help from a TA in a small setting. **Notice that you need to enrol (through ACORN or through your register) both on a lecture section and on a tutorial section separately by September 21.** Tutorials begin the week of September 19th.

Problem Sets

Hours/week: 3+

The only way to learn mathematics is to practice and receive feedback. To help you with this, there will be **8 problem sets** throughout the year. These are your deep practice and the most fundamental part of this course. You may submit problem sets individually or in groups of two people. You may change your group from problem set to problem set. One of you will need to scan your completed problem sets as pdf files and submit them electronically via Gradescope. For details, see the "Start Here" module under the course page on Quercus.

We will not be including routine computational questions on your problem sets, since you do not need our feedback to become good at these. We will include them in the practice problems, in some tutorials, and certainly in tests. You are responsible for getting enough practice so you can quickly solve such questions on tests without error.

Studying

Hours/week: 2+

After class, you should spend time organizing your notes and coming up with questions you still need answered. Your classmates, TAs, and instructors will be available on Piazza to discuss these problems with you. Also you can use office hours and MLC to get help. We also recommend putting time for studying into your weekly schedule.

You should therefore spend a total of about 10 to 11 hours per week on MAT137. This matches the expectation that full-time university students with 4 to 5 courses will spend about 40 to 55 hours per week on their studies.

6 Assessments

6.1 Pre-Calculus quiz

This is a quiz for you to refresh what we expect you to have learned in high school. It's worth 1% of your final grade.

6.2 Pre-Class quizzes

Pre-Class quizzes are low-stake assessments that contain one or two questions that can be done after you watch and understand the pre-class videos. Each quiz will take 5 to 10 minutes. There are a total of at most 70 pre class quizzes (one pre lecture hour) on Quercus. Your best 52 quizzes will count towards your final grade.

6.3 Tutorial worksheets

You will have 23 tutorial worksheets that you submit on Gradescope as your group work. These supplement your learning and deepen your understanding in lectures. You should submit your group work each week. Details about the information Only 17 of 23 will count towards your final grade.

6.4 Problem Sets

You will have 8 problem sets that you submit on Gradescope. Only your best 6 out of 8 will count towards your final grade.

6.5 Term tests

There will be four in-person term tests. **The dates and times are still tentative:**

- Test #1: Friday 21 October 2022, 4:10-6pm
- Test #2: Friday 2 December 2022, 4:10-6pm
- Test #3: Friday 10 February 2023, 4:10-6pm
- Test #4: Friday 24 March 2023, 4:10-6pm

Details will be announced on the Quercus course page three weeks before the test.

6.6 Final Exam

The three-hour cumulative final exam will be held in April 2023 and is tentatively planned to be held in-person only. Details on the format will be shared mid-semester in winter 2023. The exact date and time will be posted by the Faculty of Arts and Science. We do not permit the use of any type of calculator during term tests or the final exam.

6.7 Surveys

We may share a few surveys through out the year. They will count towards your final grade. Personally identifiable information will only be held until the course concludes in order to assign marks. Your responses to the surveys will remain anonymous.

7 Grades

7.1 Marking breakdown

Your course mark will be

- 2% Surveys
- 1% Pre-calculus quiz
- 6% Tutorial worksheets: Only your best 17 out of 23 will be counted.
- 7% Pre-class quizzes: Only your best 52 out of 70 will be counted.
- 15% Problem sets: Only your best 6 out of 8 will be counted, so each is worth 2.5%.
- 39% Term tests: Only your best 3 out of 4 will be counted, so each is worth 13%.
- 30% Final exam

7.2 Adjustments and curving

We understand that sometimes things happen (you may have a bad day, you may have multiple tests in a row, perhaps a particular test is a bit easier or a bit harder). That is why we have a generous grading scheme with automatic “adjustment” procedures built into it. This is a way to soften any blow and allow you to recuperate easily from a bad day.

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. When appropriate, we will round up to nearby letter grades but that is all. A passing grade in MAT137 should mean that you have a chance of completing MAT237, not that you are in a certain percentile of the class. We will not adjust grades just because students do well or bad. So do not ask for any additional adjustments: there will be none.

7.3 Late or missed assessment policies

Please note that Verification of Illness forms (also known as a “doctor’s note”) are temporarily not required. Students who are absent from class for any reason (e.g., COVID, cold, flu and other illness or injury, family situation) and who require consideration for missed academic work should report their absence through the online absence declaration. The declaration is available on ACORN under the Profile and Setting menu.

Late submissions will not be accepted for any assessment for any reason at all.

If you miss a pre-class quiz, tutorial worksheet, or problem set then it will be one of the assessments that are dropped according to the policies outlined above.

If you are unable to write any of the term tests for a legitimate reason (e.g. severe illness), we will accommodate you, but you must submit a short petition on Quercus **within 72 hours of the test**. No exceptions. If your petition is approved, you will be informed of your accommodation. Your accommodation may include a combination of (but not limited to) an oral exam, a written make-up test or a re-weighting of your assessments. You do not get to choose. The course coordinator will decide.

7.4 Conflicts

If you have an academic conflict for one of the tests (for example, a tutorial or a lab for a different course), then we will offer you an alternative time. For this, you will need to let us know at least one week before the date of the test. We will post more information on the Quercus course page.

7.5 Academic Integrity

How much can you collaborate on problem sets?

Discussing exercises with your other classmates is a useful and mathematically healthy practice. You will have the option to submit problem sets individually or with a partner.

If you submit individual work then, when it comes time to write up your solutions for submission, you must present solutions in your own words. To be certain, work together with other classmates in the discovery phase, but do not work together when you are writing your solutions, never share your solutions with your peers, and never have the solution written by a friend in front of you.

If you submit group work then the same rules above apply except you can write solutions with your partner. However, do not “split the tasks”. You must work on all aspects together in both the discovery and writing phase. Both of you should solve problems together and debate the solutions. One of you can write up a draft of a solution but both of you should understand, review, and edit every solution. Doing otherwise amounts to **academic misconduct**, and the penalties are severe.

If in doubt, ask us. You will never get in trouble for asking if a type of collaboration is acceptable.

7.6 Code of Behaviour

You are expected to be familiar with University of Toronto’s Code of Behaviour on Academic Matters, available here.

<https://www.academicintegrity.utoronto.ca>

Not being aware of a rule is not an excuse. If you have questions, please ask us.

The University of Toronto treats cases of academic misconduct very seriously. All suspected cases of academic dishonesty will be investigated following the procedures outlined in the Code. The consequences for academic misconduct can be severe, including a failure in the course and a notation on your transcript. **Every year, students get expelled from the University of Toronto for academic offenses.**

Potential offenses include, but are not limited to:

- Using or possessing unauthorized aids during an exam or test
- Looking at someone else’s answers during an exam or test, or showing them your answers
- Misrepresenting your identity
- Using someone else’s ideas or words without appropriate acknowledgement

Please note that a potential penalty for academic dishonesty on the Final Exam is a 0 on the Exam.

Asking a Chegg “tutor” to do your work for you, then trying to pass that work off as your own, is one example of an academic offense. This is true even if you come by the Chegg tutor’s work secondhand. Furthermore, the penalties for posting test questions on sites like Chegg are much more severe.

8 Topics of the course

Unit 1: Logic, sets, notation, definitions, and proofs

Unit 2: Limits and continuity

Unit 3: Derivatives

Unit 4: Transcendental functions

Unit 5: The Mean Value Theorem and its applications

Unit 6: Applications of limits and derivatives

Unit 7: The definition of integral

Unit 8: The Fundamental Theorem of Calculus

Unit 9: Integration methods

Unit 10: Applications of the integral

Unit 11: Sequences

Unit 12: Improper integrals

Unit 13: Series

Unit 14: Power series and Taylor series

9 Tentative daily schedule

Each color represents one unit. All assessments deadlines are tentative. These two schedules are also available on [Quercus](#).

MAT137 Tentative Schedule Fall 2022

[illegible]

MAT137 Tentative Schedule Winter 2023

Week	Starts	Notes	Tutorial Due R	Day 1	Day 2	Day 3	Problem Set (due R)	Test
13	Jan 9	Starts on M	12– Graphing	Sums and sigmas (7.1, 7.2)	Suprema and infima (7.3, 7.4)	The definition of integral (7.5-7.6)		
14	Jan 16		13– Antiderivatives	Examples and Properties of integrals (7.7,7.8,7.11)	Integral as limits (7.9-7.10)	Antiderivatives. Indefinite integrals (8.1, 8.2)		
15	Jan 23		14 – Areas	FTC Part 1 (8.3, 8.4)	FTC Part 2 (8.5, 8.6, 8.7)	Integration by substitution (9.1,9.2,9.3)	P55	
16	Jan 30		15 – Integration methods	Integration by parts (9.4,9.5,9.6)	Integration of trig fcn's (9.7,9.8,9.9)	Integration of rational fcn's (9.10,9.11,9.12)		
17	Feb 6		16 – Integration methods	Volumes (10.1)	Volumes (10.2)	Sequences (11.1, 11.2)		Test 3 (F)
18	Feb 13		17- Applications	Properties of sequences (11.3, 11.4)	Theorems about sequences (11.5, 11.6)	Big theorem (11.7, 11.8)	P56	
Feb 20 READING WEEK								
19	Feb 27		18- Sequences	Improper integrals (12.1-12.6)	BCT (12.7, 12.8)	LCT (12.9, 12.10)		
20	Mar 6		19 – Improper Integrals	Def series (13.1-13.4)	Properties of series (13.5-13.7)	Properties of series (13.8, 13.9)		
21	Mar 13		20– Series	Integrals and comparison tests (13.10-13.12)	Alternating series (13.13, 13.14)	Types of convergence (13.15,13.16, 13.17)	P57	
22	Mar 20		21 – Convergence tests	Ratio test (13.18, 13.19)	Power series (14.1, 14.2)	Taylor polynomials (14.3, 14.4)		Test 4 (F)
23	Mar 27		22– Power series	Taylor series (14.5, 14.6)	Analytic functions (14.7, 14.8)	New power series (14.9, 14.10)		
24	Apr 3	Ends on R	23 - Power series	Applications (14.12,14.14)	Applications (14.11, 14.13, 14.15)	Outroduction	P58	

Important dates

- 21 Sep 2022 – Last date to add a course, or to add or change a lecture section or tutorial section
- 20 Feb 2023 – Last date to drop the course without academic penalty.

For more details, please check this link:

<https://www.artsci.utoronto.ca/current/dates-deadlines/academic-dates>

10 Copyright

There are on-campus and off-campus enterprises out there that offer so-called “course preparation” and that will ask you to provide course material to them, sometimes in exchange for money, sometimes in exchange for “free help”, sometimes without any direct benefit to you. You must not share the material of this course with such enterprises. They make a profit selling our intellectual property that we choose to give for free to members of our classes.

The copyright holders hereby **explicitly deny you the right to share the course material** with anyone who is not enrolled in the course. If you choose to do so anyways, **you are acting illegally** and we will not hesitate to initiate legal proceedings against you. Furthermore, depending on what material you share and how you share it, **you might also be committing an academic offense**. In that case, on top of the non-academic prosecution of your offense, you will face academic disciplinary action.

11 Email Policy

1. If you do not email us from your _____@mail.utoronto.ca address, then your email will be ignored.
2. Please put MAT137 in the subject when you send out an email.
3. If you have questions about course policies, please triple-check the syllabus before emailing.
4. Instead of emailing us mathematical questions, please post them on Piazza. This helps us ensure all questions get responses in a timely manner. Additionally, everyone can benefit from the discussion that your post may generate.