

Disclaimer: Due to the nature of the Winter 2021 term, parts of this outline are subject to change. Any such change would be handled in as fair a way as possible.

# Math 138

## Overview

The goal of this course is to further expand your knowledge of calculus and its applications for one-variable functions. The course can broadly be split into three parts. First, we will explore areas under curves and the Fundamental Theorem of Calculus, integration techniques, and applications of integration including finding the area between two curves, volumes of solids of revolution, and the average value of a function. Secondly, we will examine differential equations. We will study how to solve separable differential equations and linear differential equations as well as their applications to population growth and Newton's Law of Cooling. Finally, we investigate infinite series. Various tests of convergence will be introduced for series of numbers. Then, we study power series with a focus on Taylor series and look at their applications.

## Illness

For the most up-to-date procedures regarding COVID (or symptomatically related illness) please visit [here](#).

You should still attempt to follow along and complete course elements online while isolating/ill. Exceptions will only be made on a case-by-case basis and will require the completion of a VIF (see info [here](#)).

## Office Hours

Due to COVID-19 in person office hours are not allowed for the Winter 2021 term.

The plan for Math 138 this term is to have a giant timetable of office hours hosted by instructors and possibly some TAs. These should be available to ALL students so you will simply have to find the most convenient time to join. You are allowed to join multiple office hours as you see fit.

You will be added to a team in Microsoft Teams for Math 138 which will solely be used for office hours.

Calculus 2 for Math students

Winter 2021

## Textbooks

**Course notes:** Calculus 2 for Honours Math Course notes (by B. and B. Forrest)

Available for free [here](#)

A physical copy can be purchased from the UW Bookstore [here](#)

**MyLabMath (Optional):** you can purchase access through the UW Bookstore [here](#)

**Briggs - E-text (Optional):** this is just an upgraded version of MyLabMath that includes a digital textbook.

## Other Resources

[learn.uwaterloo.ca](http://learn.uwaterloo.ca) – Course Website

[math138@uwaterloo.ca](mailto:math138@uwaterloo.ca) - Administrative Questions

[CampusWire](#) – (code 3354) Content Questions

[Crowdmark](#) - submit assignments

Midterm and Final Exam  
(tentative)

M: March 3-5; FE: April 17-19

## Marking Scheme

30% Written Assignments

30% Midterm

40% Final Exam

## Safety:

If you are coming to campus, please take precautions to help limit the spread of COVID-19:

- Complete the COVID-19 screening questions using the [Campus Check-In Tool](#) before arriving on campus each day.
- Wear a face mask when you're in [common areas of buildings](#) or in any area where physical distancing is a challenge.
- Maintain a 2m distance from others at all times and follow the posted signage.
- When visiting campus and using any University facilities, be sure to observe public health guidance, the safety protocols we have issued to date, as well as any additional expectations for the particular space you are using. For example:
  - ▶ Instructors will go over specific expectations in the classroom or lab.
  - ▶ When using study spaces, you must maintain 2 metres distance from others at all times. These rules apply to everyone using the space, even if you are studying with roommates or anyone in your "social bubble."
  - ▶ Common areas may have designated seating or capacity limits. Follow the guidance on the posted signs.

If a student fails to follow University health and safety guidelines or public health regulations, they may be guilty of a non-academic offence under [Policy 71 – Student Discipline](#) and face disciplinary action.

Due to illness or mandate it may become necessary to close on-campus sections and move students online. The on-campus courses will follow the same schedule and use the same assessments as the online sections, so if we need to switch the transition will hopefully be seamless.

## Assignments

The written assignments will be available through and due on *Crowdmark*. *Crowdmark* is an extremely user friendly piece of software that basically requires you to scan/take a photo of your work (even if it's multiple pages) and upload them to your submission. If you write them digitally on your computer itself then you are one step ahead.

**Please try and crop your pictures or at the very least make sure the writing is visible. You could lose all of your marks if we can't read your submission. The use of third-party software like Genius Scan is encouraged.**

There will also be some multiple choice questions to be answered on Crowdmark alongside your written assignment.

Each assignment should be available at least one week before they are due. Unless stated otherwise the due date will be 5pm on Fridays (with 2 exceptions as of this writing). Eventually, solutions will be posted on Learn (likely within a week). It is important to work out your own solutions, using those posted only as a check or for the occasional hint. **Late submissions will not be accepted.**

## Midterm and Exam

The format of the midterm and final will be dependent on how everything goes with the weekly assignments. These are **tentatively** scheduled for March 3-5 (midterm) and April 17-19 (final exam).

## Campuswire and Email

*Campuswire* is an elegant way to organize various communications throughout the course. This includes certain announcements and questions that you may have. **You should think of *Campuswire* as the place to ask questions about math.** If you have a concern about the assignment, the on-campus lectures, the online videos or basically anything you think would help others then please post a **public** question on *Campuswire* so that everyone can see the answer. You can make yourself anonymous on a post-by-post basis if you feel the need.

Private questions are ok too just think about the nature of your question before deciding the visibility status.

Note that Campuswire supports LaTeX syntax for Math. There's also a built-in formula editor that ultimately pastes the LaTeX code. There is a good LaTeX primer at <http://tug.ctan.org/info/undergradmath/undergradmath.pdf>

(Note: the university is in the process of moving away from Piazza. We apologize for the platform change from what you may have been used to in previous terms).

For administrative questions (e.g. enrollment changes, grade issues, technical problems etc.) please use [math138@uwaterloo.ca](mailto:math138@uwaterloo.ca). **You should think of this email address as the place to ask non-math questions (including remark requests).**

## Practice and MyLabMath

Each week we will post a set of problems that you should read over and try to answer by yourself. Note that the material in the practice is meant to give you a deeper understanding of what it is you are studying. The solutions will be posted at a slightly later date.

We have also partnered with Pearson to offer an **optional resource** called MyLabMath (it can be purchased from the UW bookstore). The base level (\$50) grants access to a plethora of practice questions, videos and interactive widgets. The second tier (\$100) also gives access to a digital textbook. If you are interested in this it is suggested you try the \$50 version first as you can always upgrade at a later date.

We will be working with Pearson to provide a catered set of assessments each week to match the content that is currently being taught in the course. Note that these will not be for marks. The technology is supposed to identify weak spots and provide catered practice based on this.

## Integrity

In order to maintain a culture of academic integrity, members of the University of Waterloo community are expected to promote honesty, trust, fairness, respect and responsibility. It is your responsibility to know the information at [this link](#) before taking a course.

## Grievance

A student who believes that a decision affecting some aspect of his/her university life has been unfair or unreasonable may have grounds for initiating a grievance. Read Policy 70, Student Petitions and Grievances, Section 4 (as seen [here](#)). When in doubt please be certain to contact the department's administrative assistant who will provide further assistance.

## Discipline

A student is expected to know what constitutes academic integrity to avoid committing academic offenses and to take responsibility for his/her actions. A student who is unsure whether an action constitutes an offense, or who needs help in learning how to avoid offenses (e.g., plagiarism, cheating) or about "rules" for group work/collaboration should seek guidance from the course professor, academic advisor, or the undergraduate associate dean. For information on categories of offenses and types of penalties, students should refer to Policy 71, Student Discipline (as seen [here](#)). For typical penalties check Guidelines for the Assessment of Penalties (as seen [here](#)).

## Appeals

A decision made or penalty imposed under Policy 70, Student Petitions and Grievances (other than a petition) or Policy 71, Student Discipline may be appealed if there is a ground. A student who believes he/she has a ground for an appeal should refer to Policy 72, Student Appeals (as seen [here](#)).

## AccessAbility

The AccessAbility Office, located in Needles Hall, Room 1132, collaborates with all academic departments to arrange appropriate accommodations for students with disabilities without compromising the academic integrity of the curriculum. If you require academic accommodations to lessen the impact of your disability, please register with the AccessAbility Office at the beginning of each academic term.

Given that everything is currently physically closed you can find them at:

<https://uwaterloo.ca/accessability-services/>

519-888-4567, ext. 35082

[access@uwaterloo.ca](mailto:access@uwaterloo.ca)

## Mental Health

Please don't hesitate to make use of the services below if you are feeling overwhelmed or have the slightest inclination that you are in need of some support.

### On-campus Resources:

Campus Wellness <https://uwaterloo.ca/campus-wellness/>

Counselling Services: [counselling.services@uwaterloo.ca](mailto:counselling.services@uwaterloo.ca)/ 519-888-4567 ext 32655

MATES: one-to-one peer support program offered by Federation of Students (FEDS) and Counselling Services: [mates@uwaterloo.ca](mailto:mates@uwaterloo.ca)

Health Services: located across the creek from the Student Life Centre, 519-888-4096.

### Off-campus Resources:

Good2Talk (24/7): Free confidential help line for post-secondary students. Phone: 1-866-925-5454

Here 24/7: Mental Health and Crisis Service Team. Phone: 1-844-437-3247

OK2BME: set of support services for lesbian, gay, bisexual, transgender or questioning teens in Waterloo. Phone: 519-884-0000 extension 213

## Diversity

It is our intent that students from all diverse backgrounds and perspectives be well served by this course, and that students' learning needs be addressed both in and out of class. We recognize the immense value of the diversity in identities, perspectives, and contributions that students bring, and the benefit it has on our educational environment. Your suggestions are encouraged and appreciated. Please let us know ways to improve the effectiveness of the course for you personally or for other students or student groups. In particular:

We will gladly honour your request to address you by an alternate/preferred name or gender pronoun. Please advise us of this preference early in the semester so we may make appropriate changes to our records.

We will try to honour your religious holidays and celebrations. Please inform of us these at the start of the course.

We will follow AccessAbility Services guidelines and protocols on how to best support students with different learning needs.

## Schedule

An approximate schedule of topics is listed below. Note that the weeks are numbered based on the corresponding assignment (e.g. Assignment 1 will be on stuff from Week 1, Assignment 2 on stuff from Week 2, etc.)

Note the special break days (**March 15-16**) and Good Friday (**April 2**) and of course reading week (**Feb 15-19**).

Week	Course notes sections	Topics
1 Jan 11-15	1.2-1.4	Riemann Sums, Definite Integrals, Average Value
2 Jan 18-22	1.5-1.7	FTC I, FTC II, Change of Variable
3 Jan 25-29	2.1-2.3	Trig. Sub., Integration By Parts, Partial Fractions
4 Feb 1-5	2.4, 3.1	Improper Integrals, Areas Between Curves
5 Feb 8-12	3.2, 3.3, 4.1, 4.5.1	Volumes, Intro to DEs, Direction Fields
RW Feb 15-19	Reading Week	
MT Feb 22-26	4.2, 4.3, 4.6-4.8	Separable DEs, Linear DEs, Applications
6 Mar 1-5	5.1-5.4	Intro to Series, Geo. Series, Div. Test
7 Mar 8-12	5.5-5.7	Positive Series, Integral Test, Alternating Series
8 Mar 15-19 (Mar 15-16: no classes)	5.8-5.10	Types of Convergence, Ratio and Root Tests
9 Mar 22-26	6.1-6.4	Intro. to Power Series, Functions, Differentiation
10 Mar 29 - April 2 (April 2: no classes)	6.5-6.8	Integration, Review of Taylor Polys, Taylor Series
FE April 5-9	6.9-6.10	Taylor polynomials, Taylor's Theorem
Final classes April 12-14	Review/Catch-up	

## Learning Outcomes:

by the end of this course, students will be able to:

- Write clear and well-organized mathematical solutions and proofs.
- Solve problems in Calculus through logical thinking and careful analysis.
- Set up and evaluate Riemann integrals for simple functions
- Utilize the Fundamental Theorem of Calculus to evaluate definite integrals.
- Apply various integration techniques including change of variable, integration by parts, trigonometric substitution, and partial fractions.
- Solve problems with integration including improper integrals, areas between curves, and volumes of revolution.
- Solve separable and first-order linear differential equations.
- Model real-world problems with differential equations.
- Understand infinite series and convergence (both absolute and conditional).
- Apply various series convergence tests.
- Compute the radius and interval of convergence for power series.
- Compute the Taylor series for many elementary functions.
- Use Taylor series to solve application problems.