

MATH*2200 Advanced Calculus I

Fall 2022



(Revision 2: October 13, 2022)

For information on current safety protocols, follow these links: <https://news.uoguelph.ca/return-to-campuses/how-u-of-g-is-preparing-for-your-safe-return/>
<https://news.uoguelph.ca/return-to-campuses/spaces/#ClassroomSpaces>

Please note, these guidelines may be updated as required in response to evolving University, Public Health or government directives.

DISCLAIMER:

Please note that the ongoing COVID-19 pandemic may necessitate a revision of the format of course offerings, classroom schedules, and academic schedules. Any such changes will be announced via CourseLink and/or class email. This includes on-campus scheduling during the semester, mid-terms, and final examination schedules. All University-wide decisions will be posted on the COVID-19 website <https://news.uoguelph.ca/2019-novel-coronavirus-information/> and circulated by email.

1 INSTRUCTIONAL SUPPORT

1.1 Instructors

Kimberly M. Levere, Ph.D.

Office: MacN 539, ext. 56908

Email: klevere@uoguelph.ca

Office hours: Tuesdays 3:30pm – 4:30pm, SSC*1511
Thursdays 2:00pm – 3:00pm, SSC*1511
Fridays 9:30am – 10:30am, SSC*1511

1.2 Teaching Assistants

Grace D'Agostino

Cameron Jakub

Ahmad Naser

2 LEARNING RESOURCES

2.1 Course Website

Course material, news, announcements, and grades will be regularly posted to the MATH*2200 Course site. You are responsible for keeping up-to-date on this site.

2.2 Required Resources

K. Levere & N. Boettger, *MATH*2200 – Advanced Calculus I Course Manual 2nd Edition*, available at the MacNaughton Book Store. This is the primary resource for the course and functions both as the textbook, and as a notebook that we will complete together in class as the course progresses. It can be purchased as a printed copy only. Please be sure that you have the current version, the 2nd edition, (only available in the MacNaughton bookstore). I have made considerable changes since the last edition (including adding practice questions at the end of every section) so it is imperative that you get this newer edition! Remember that this resource is protected by copyright and is not to be sold or redistributed in any form.

2.3 Recommended Resources

Not applicable

2.4 Additional Resources

Lecture Information: All lectures will be delivered entirely face-to-face, in person. Lectures will not be recorded or streamed. Given the changes made to the course manual this year, I do not have existing lecture videos to offer. Completed lecture notes will be uploaded to the course website at the end of every week. It is, however, strongly recommended that you attend every class.

Other: Past tests, supplementary questions, and other resources may be posted to the Course website as needed. Again, it is important that you check regularly to keep up-to-date.

2.5 Communication & Email Policy

Major announcements will be posted to the course website. **It is your responsibility to check the course website regularly.** As per university regulations, all students are required to check their <uoguelph.ca> e-mail account regularly: e-mail is the official route of communication between the University and its student.

2.6 Online Behaviour and Etiquette

Online Behaviour:

Inappropriate online behaviour will not be tolerated. Examples of inappropriate online behaviour include:

- Posting inflammatory messages about your instructor or fellow students
- Using obscene or offensive language online
- Disrupting a class/office hour by discussing entirely unrelated content to that of MATH*2200.
- Copying or presenting someone else's work as your own
- Adapting information from the Internet without using proper citations or references
- Buying or selling term papers or assignments
- Posting or selling course materials to course notes websites
- Having someone else complete your quiz or completing a quiz for/with another student
- Making false claims about lost quiz answers or other assignment submissions
- Threatening or harassing a student or instructor online
- Discriminating against fellow students, instructors or TAs
- Using the course website to promote profit-driven products or services
- Attempting to compromise the security or functionality of the learning management system
- Sharing your username and password
- Recording lectures without the permission of the instructor

Any student that does not conduct themselves in an appropriate manner in any online lecture or office hour session will be issued a penalty of a 0.5% deduction on their final grade. This will apply each time inappropriate online conduct occurs. Please be kind to each other and conduct yourself with maturity and professionalism.

Disclaimer: Student Identity Disclosure in Recordings

The university has requested that I include the following disclaimer regarding recorded materials. While I don't anticipate the use of any videos or recordings as our class will be run entirely face-to-face, I want to ensure that we are prepared in the case that the pandemic pushes us in this direction.

By enrolling in a course, unless explicitly stated and brought forward to their instructor, it is assumed that students agree to the possibility of being recorded during lecture, seminar or other "live" course activities, whether delivery is in-class or online/remote.

If a student prefers not to be distinguishable during a recording, they may:

1. turn off their camera
2. mute their microphone
3. edit their name (e.g., initials only) upon entry to each session
4. use the chat function to pose questions.

Students who express to their instructor that they, or a reference to their name or person, do not wish to be recorded may discuss possible alternatives or accommodations with their instructor.

2.7 Getting Help

My number one priority is to ensure that you are supported and have lots of opportunities to ask questions and get help! Here are some options for getting help in this course:

- Ask questions during our lectures, Tuesday/Thursday 8:30am-9:50am
- Come office hours. Don't ever hesitate to drop in, even if you think you are behind in your studying. Getting you caught up is **exactly** what those opportunities are there for!
- Post to the discussion board on Courselink. This is a great place to post your questions! I will check this often and respond as soon as I am able. I have even given you the option to post anonymously in case you are shy! 😊 It is also a great way for you to help others if you see a question that someone else posts that you can help out with! This is one of the best ways to master a concept: by explaining it to someone else!
- Send me an email (klevere@uoguelph.ca). Since there are over 100 of you and only ONE of me, I would prefer to answer questions in a group forum (so that I can help more of you at once), but certainly for more personal queries, this is a great option. If you ask questions by email (or even in Courselink!), it would be extremely helpful for you to attach a picture of your work, so I can easily see where you might be stuck and be able to help you more quickly. I usually try to respond within a few hours. However, I get a lot of email from students and I need to make sure that I have the chance to help as many people as I can in the time I have! So be warned that if you send me many emails with various questions, it may take a day or two to get back to you.

3 ASSESSMENT

3.1 Dates and Distribution

	Scheme #1	Scheme #2	Scheme #3
Academic Misconduct Quiz	1%	1%	1%
Assignments (total of 5)	15% (3% each)	15% (3% each)	15% (3% each)
Term Test 1**	22%	12%	22%
Term Test 2**	22%	22%	12%
Final Exam**	40%	50%	50%

Your final grade will be calculated using the most favourable of the above grading schemes.

****You must receive at least 50% of the marks available, in total, on the term tests and final exam that are used to calculate your final grade. That is,**

$$\frac{(\text{Total marks earned on term tests and exam})}{(\text{Total marks available on term tests and exam})} \geq 50\%$$

If you do not achieve this, your maximum possible final grade will be 48%, *no matter what grade you receive on the Written Assignment component*. Provided that you satisfy the above equation, your final grade will be calculated using the above listed grading scheme.

Considerations may be made according to the policies listed in Section 3.2.

For example: suppose that Kevin receives 20/30 on TT1, 5/25 on TT2 and 26/45 on the final. The above calculation for Kevin would be:

$$(20+5+26) \div (30+25+45)=0.51$$

Since this is greater than 0.50, Kevin is eligible to pass, and his grade will be calculated according to the weighted grading schemes listed above (including his assignment marks).

On the other hand, suppose that Luke receives 18/30 on TT1, 7/25 on TT2 and 20/45 on the final. Then for Luke:

$$(18+7+20) \div (30+25+45)=0.45$$

Since this is less than 0.5, Luke would be awarded a maximum grade of 48% (his grade would be calculated according to the weighted grading schemes above but would then be capped at 48%).

Written Assignments: There will be 5 written assignments due throughout the term (see schedule below). Each assignment will contribute 3% toward your final grade. Assignments will cover 1-2 weeks' worth of course content (or relevant review content) and are meant to help you to practice what you are learning and obtain feedback so that you can correct any errors or misconceptions you might have before term tests and the exam. You may use your course notes and work together with your peers to figure things out, but you must write up your own individual solutions for submission. This includes the use of any online resource or calculator, app, etc. Copying another person's answers (or obtaining your answer from another source) is academic misconduct and will not be tolerated. You may use other textbooks and online resources only BEFORE an assignment has been posted. Once an assignment has been posted, you can only use our course manual, your peers and myself to get help in figuring out concepts and questions that you are struggling with. This structure should go a long way in preventing academic misconduct.31415

Assignment 1: Friday, September 23, 2022 (Week 2)
Upload by 12:00 noon to Gradescope

Assignment 2: Friday, October 7, 2022 (Week 4)
Upload by 12:00 noon to Gradescope

Assignment 3: Friday, October 28, 2022 (Week 7)
Upload by 12:00 noon to Gradescope

Assignment 4: Friday, November 11, 2022 (Week 9)
Upload by 12:00 noon to Gradescope

Assignment 5: Friday, November 25, 2022 (Week 11)
Upload by 12:00 noon to Gradescope

Academic Misconduct Quiz: I think that written assignments are a fabulous learning tool and one that I've had students tell me that they enjoy when it comes to assessments. One of my biggest concerns with assignments is academic integrity. The fact is, there are a huge number of online resources and softwares out there that have the capability to give you the answers you need to complete written assignments. **This is not how I intend written assignments to be completed.** Remember that these assignments are here to help you learn and obtain feedback on your thought processes. They are also a response to requests from past students that have identified assignments as an assessment preference (perhaps because they induce less stress than a proctored test, for instance). I expect that you are taking this course because you are interested in the content and/or to meet a requirement of your degree. Hopefully, that alone is motivation enough to **do things honestly and without the use of any of these online tools or softwares!** It is therefore my expectation that **assignments will not be a source for academic misconduct.**

To ensure that everyone fully understands what academic misconduct is, I ask that you read the documentation on this subject on the University of Guelph website found here:

<https://calendar.uoguelph.ca/undergraduate-calendar/undergraduate-degree-regulations-procedures/academic-misconduct/>

After reading about Academic misconduct, you'll be required to complete a quiz that tests your understanding. This quiz will be completed in Courselink and you will have unlimited attempts (your highest score will count as your mark). You must complete this quiz with a grade of 80% or higher before any assessments are submitted for grading (that is, prior to September 23rd at noon). Failure to do so will result in a grade of 0% on any assessments that occur prior to you mastering this quiz.

Term Tests:

Test 1: Friday, October 21st, 2022 (Week 6)
6:00pm-7:30pm (90 minutes to write).
Location: ROZH*102
Closed-book, closed resource, independent
Covers Chapters 1-2 inclusive

Test 2: Friday, November 18th, 2022 (Week 10)

6:00pm-7:30pm (90 minutes to write).
Location: ROZH*102
Closed-book, closed resource, independent
Covers Chapters 3-4 inclusive

Final Exam: Monday, December 5th, 2022
7:00pm-9:00pm (120 minutes to write).
Location: TBA
Closed-book, closed resource, independent
Cumulative

*Should face-to-face instruction be shut down at any point by the administration, any assessments completed during such a shutdown will be proctored via Zoom according to the schedule above. Please ensure that you have a working web camera should we need to run assessments in this way.

3.2 Course Grading Policies

Academic Consideration: When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons, please advise the course instructor in writing, with your name, ID number, and e-mail contact. See the academic calendar for information on regulations and procedures for Academic Consideration:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml>

Illness: Medical notes will not normally be required for singular instances of academic consideration, although students may be required to provide supporting documentation for multiple missed assessments or when involving a large part of a course (e.g. final exam or major assignment).

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to religious obligations, please email the course instructor at the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Accommodation of Religious Obligations:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml>

Missed term tests, assignments, or quizzes: Missed quizzes and tests will receive a grade of 0%, unless you miss an assessment due to any of the above reasons and **bring it to the attention of the course instructor within 1 week of the assessment date in a written email**, in which case the weight of the missed assessment will be added to the final exam. There will be no makeup tests or quizzes.

Passing grade: In order to pass the course, you must receive a final grade of at least 50%. Additionally, in order to pass this course, you must receive at least 50% of the marks available collectively, on the term tests and final exam that are used to calculate your final grade. If you do not achieve this, your maximum possible final grade will be 48%.

Group Work: You are encouraged to work together to learn the course material and complete For You to Try exercises. All quizzes, term tests and the final exam are individual assessments and must be completed independently.

Copies of out-of-class assignments: Keep paper and/or other reliable back-up copies of assignments, homework, and your midterm. You may be asked to submit this work at any time.

4 AIMS, OBJECTIVES & GRADUATE ATTRIBUTES

4.1 Calendar Description

The topics covered in this course include infinite sequences and series, power series, tests for convergence, Taylor's theorem and Taylor series for functions of one variable, planes and quadratic surfaces, limits and continuity, differentiability of functions of two or more variables, partial differentiation, directional derivatives and gradients, tangent planes, linear approximation, Taylor's theorem for functions of two variables, critical points, extreme value problems, implicit function theorem, Jacobians, multiple integrals and change of variables.

Credit Weight: 0.5 **Department:** Mathematics & Statistics **Campus:** Guelph

Prerequisite: One of IPS*1510, MATH*1090, MATH*1210, or MATH*2080.

4.2 Course Aims

This course extends the ideas and concepts covered in a first Calculus course to multi-variable functions. We also extensively explore infinite sequences and series and their convergence. We explore more complex examples, explore the “why” of concepts (as well as the “how to”), and dig into more mathematical proofs of theoretical results. The main goals of the course are (1) to teach students the Calculus concepts listed in section 4.1 at a level that promotes a deep understanding and (2) to prepare students for future courses in mathematics that make express use of the concepts studied here.

4.3 Learning Objectives

At the successful completion of this course, the student will have demonstrated the ability to:

1. Understand the concept of convergence of a sequence or series and be able to apply a variety of methods for assessing this quality.

2. Be able to determine the domain of a multi-variable function, and understand the notions of range, level curves and traces of a surface.
3. Be able to assess when a function does and does not exist using a variety of techniques including uniqueness of limits, conjugate, factoring, common denominator, formal definition of the limit, and the Squeeze Theorem.
4. Calculate partial derivatives and understand their physical meaning.
5. Be able to establish if a multi-variable function is differentiable at a point.
6. Have an understanding of the tangent plane to a surface at a point and use this tangent plane to approximate surfaces nearby.
7. Calculate partial derivatives involving the chain rule.
8. Understand the notion of a directional derivative and be able to calculate them.
9. Calculate the gradient vector and understand applications of this important mathematical construct.
10. Apply knowledge of derivative theory to find local and global extrema.
11. Understand the derivation of the method of Lagrange multipliers and use this method to solve constrained optimization problems.
12. Calculate double integrals over rectangular regions, including an understanding of Fubini's theorem.
13. Calculate double integrals over Type I and Type II bounded regions and understand how and when one can change the order of integration.
14. Understand the derivation of the change of variables theorem for multi-variable functions, including the definition and use of the Jacobian matrix.
15. Calculate double integrals by transforming to polar coordinates.

4.4 Instructor's Role and Responsibility to Students

As your instructor, I must:

1. Develop and deliver course material in a professional way that facilitates learning for a variety of students and learning styles.
2. Attend all lectures, filling in the Course Manual as we proceed in each lecture. I will provide completed course notes online regularly, but I strongly urge you to come to class. Bear in mind that most Tutorials will not use the Course Manual and these completed notes might not be provided to you.
3. Respond to you. This includes, as time permits, questions in lectures and lab tutorials, after classes, during office hours, or through email (where I reserve the right to reply within a timeframe of 1-2 days). You are more than welcome to contact me at any time through these means if you have questions or concerns about the course or the course material.

- Evaluate you fairly, and fairly as compared to your peers, providing prompt feedback on your performance and justification for your grade. I must provide academic consideration, where appropriate, as described in Section 3.

4.5 Students' Learning Responsibilities

As a member of this class, you are expected to:

- Take advantage of the learning opportunities provided during lectures;
- Treat others with respect and dignity whenever you address them, in-class or online;
- Genuinely try For You To Try problems in a timely manner, on your own time;
- Seek help if you have tried the homework and are still having difficulty with the course content. This means contacting me (*not* just at the last minute!) and possibly considering other resources as I recommend them to you;
- Check all grades against tests that have been returned to you, once they are posted to the Course website, to verify that the correct mark has been recorded; and
- Notify me, as described in Section 3, in the case that there are missed tests/quizzes or academic conflicts that are known in advance. If illness, work, or extra-curricular activities are causing you to struggle, you are advised to keep me up-to-date on your progress, so that I can be more helpful to you.

5 TEACHING AND LEARNING ACTIVITIES

5.1 Timetable

Lectures (in-person)

Tuesday	8:30am – 9:50am	ROZH*102
Thursday	8:30am – 9:50am	ROZH*102

5.2 Lecture Schedule

(schedule is approximate and subject to change depending on time constraints)

Lectures (Week)	Lecture Topics	References
1	Sequences Some Well-Known Series Divergence Test	Chapter 1, Section 2.1, Section 2.2.1
2	The Integral Test Comparison Tests and Limit Comparison Test	Section 2.2.2 Section 2.2.3 Section 2.2.4
3	Alternating Series Test	Section 2.2.5

	Ratio and Root Tests	Section 2.2.6
	Power Series	Section 2.3.1
4	Manipulation of Power Series, Taylor and MacLaurin Series	Section 2.3.2 Section 2.4
5	Multi-variable Functions	Section 3.1
	Limits & Continuity of Multi-variable Functions	Section 3.2
6	The Squeeze Theorem for Multi-variable Functions	Section 3.2
	Partial Derivatives & Physical Interpretation	Section 4.1
7	Tangent Planes and Linear Approximation	Section 4.2.1/2
	Differentiability	Section 4.2.3
	The Chain Rule	Section 4.3
8	Directional Derivatives	Section 4.4
	The Gradient Vector	Section 4.5
9	Critical Points and Local Extrema	Section 5.1
	Curve Sketching	Section 5.2
10	Optimization	Section 5.3
	Lagrange Multipliers	Section 5.4
11	Multi-variable Integrals Over Rectangular Regions	Section 6.1
	Multi-variable Integrals Over General Bounded Regions	Section 6.2.1
	Changing the Order of Integration	Section 6.2.2/3
12	Change of Variables for Multi-variable Functions	Section 6.3.1/2
	Multi-variable Integrals in Polar Coordinates	Section 6.3.3

5.3 Other Important Dates

First day of classes: Thursday, September 8th, 2022.

Thanksgiving: Monday, October 10th, 2022 (no classes; rescheduled to Friday, December 2nd)

Fall Study Day: Tuesday, October 11th, 2022 (no classes; rescheduled to Thursday, December 1st)

Last day of classes: Friday, December 2nd, 2022.

Drop Date: Courses that are one semester long must be dropped by the end of the last day of classes (**Friday, December 2nd, 2022**); two-semester courses must be dropped by the last day of classes in the second semester. The regulations and procedures for [Dropping Courses](#) are available in the Undergraduate Calendar.

<https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml>

Course Evaluation Information: Near the end of the term, you will be given the opportunity to evaluate your instructor and provide comments regarding your experience. The evaluations for this class will be done in-class. Your instructor will inform you of when these are to take place.

6 ACADEMIC MISCONDUCT

The University of Guelph is committed to upholding the highest standards of academic integrity and it is the responsibility of all members of the University community faculty, staff, and students to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff and students have the responsibility of supporting an environment that discourages misconduct. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it.

Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

6.1 Resources

The Academic Misconduct Policy is detailed in the Undergraduate Calendar:

<http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml>

A tutorial on Academic Misconduct produced by the Learning Commons can be found at:

<http://www.academicintegrity.uoguelph.ca/>

7 ACCESSIBILITY

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required, however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre **requires students to book their exams at least 14 days in advance, and no later than November 1**. Similarly, new or changed accommodations for online quizzes, tests, and exams must be approved at least a week ahead of time.

More information: www.uoguelph.ca/sas

8 RECORDING OF MATERIALS

Presentations which are made in relation of course work – including lectures – cannot be recorded or copied without the permission of the presenter, whether the instructor, classmate or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

Posted online videos and course notes are the property of the instructor and are not to be otherwise disseminated beyond this course.

9 RESOURCES

The Academic Calendars are the source of information about the University of Guelph's procedures, policies and regulations which apply to undergraduate, graduate and diploma programs.

<http://www.uoguelph.ca/registrar/calendars/index.cfm?index>

10 MENTAL HEALTH RESOURCES

One out of every five students in Canada experiences some sort of mental health issue at some point in their academic career. If you find yourself facing a mental health crisis, or just need to talk to someone, please consider taking advantage of one of the following resources available to University of Guelph students:

Counselling Services: Visit the Counselling Services website (<https://wellness.uoguelph.ca/counselling>) to get information on resources available to you, both online and in-person. You can also visit them at Health Services (J.T. Powell Building, ext 53244) where they offer individual and group counselling sessions by appointment or walk-in.

Student Support Network: is located in the Wellness & Education Promotion Centre in the J.T. Powell Building and offers confidential, peer-based, drop-in support.

Good2Talk: ([1-866-925-5454](tel:1-866-925-5454)) is a free, 24/7 student hotline that provides professional counselling and referrals for mental health, addictions and well-being.

Here 24/7: [1-844-437-3247](tel:1-844-437-3247) specializes in assessment, referral and appointment booking and is available 24/7 for crisis support.

You are not alone and you will not be judged for asking for help.
