Western Science

MATH 1225B - METHODS OF CALCULUS

COURSE OUTLINE

WINTER 2023

1. COURSE INFORMATION

Instructor:	Sergio Zapata	**Delivery Mode:**	In Person
Email:	szapatac@uwo.ca	**Class Day/Time:**	MWF 12:30-1:30 pm
Office Hours:	MTuWTh (see OWL)	**Class Location:**	MC 110
Office Location:	MC 286	**Term:**	Winter 2023

Prerequisites. Ontario Secondary School MCV4U or Mathematics 0110A/B.

Unless you have either the requisites for this course or written special permission from your Dean to enroll in it, you may be removed from this course and it will be deleted from your record. This decision may not be appealed. You will receive no adjustment to your fees in the event that you are dropped from a course for failing to have the necessary prerequisites.

Antirequisites. Applied Mathematics 1201A/B, Calculus 1301A/B, Calculus 1501A/B, Mathematics 1230A/B, Numerical and Mathematical Methods 1412A/B, the former Applied Mathematics 1412A/B, the former Applied Mathematics 1413. If Calculus 1000A/B or Calculus 1500A/B was completed after September 1, 2016 it is an antirequisite, but not if it was completed before that time.

2. COURSE DESCRIPTION

The introduction of the coordinate plane by Descartes established a bridge between geometry and algebra, drastically changing the way we viewed mathematics; this provided a framework for the development of calculus. Indeed, the coordinate plane allows us to realize real-world processes geometrically. For instance, if we let y be the price of a stock at a given time x, then we could plot the points (x, y) as x progresses in time, yielding a curve (a geometric object!) in the plane. One can study properties of this curve (with the help of algebra) such as its length, the area enclosed by the curve and the x-axis, the existence of tangent lines to the curve, its behaviour when x is very small or large, etc. Surprisingly enough, all of these properties have something meaningful to say in terms of the original problem. For instance, in our example, slopes of tangent lines to the curve tell us how fast the price of the stock is changing over time while the area reveals information about the average price of the stock.

The example above is just one of the many processes which can be modelled as curves in the coordinate plane. This course introduces a set of tools to study these curves. They are grouped into three main categories: limits (behaviour of the graph of a curve as x is getting close to a fixed real number a), differentiation (rate of change, tangent lines), and integration (area under a curve, averages).

List of topics covered. Logarithmic, exponential and trigonometric functions; integration, applications of integration; techniques of integration, improper integrals; functions of several variables, Second Partials Test, Lagrange Multipliers; first order differential equations and their applications.

Learning Outcomes. Upon successful completion of this course, students will be able to:

- Use the properties of exponents/logarithms to evaluate and simplify exponential/logarithmic expressions.

- Use inverse properties of exponential and logarithmic functions to solve exponential and logarithmic equations.

- Define and evaluate trigonometric functions.

- Find the derivative of elementary functions.

- Use techniques of integration and choose the most appropriate technique to solve integration problems.

- Define multivariate functions and find their maxima and minima.

- Identify differential equations and classify them into separable and first-order linear differential equations equations.

- Solve separable and first-order linear differential equations.

Important dates.
Classes begin: January 9, 2023
Classes end: April 10, 2023
Exam Period: April 13 – 30, 2023

What is expected of the student?

- Students are expected to demonstrate understanding of the methods and theory of calculus and the ability to adjust them to **solve new problems.**

- Students must assume responsibility for staying up to date with course content and for being aware of posted deadlines. As you can see in the table below, there is a lot covered in this course. Moreover, the topics heavily build one on the other. Therefore, **it is essential that you keep up with the course material and the suggested exercises week by week**.

- **Students are expected to seek out help when needed.** The course instructor will host drop-in office hours regularly throughout the week. The schedule will be posted on OWL in the coming weeks. Additionally, students can get free drop-in assistance at the Math Help Centre. **Students are strongly encouraged to make regular use of these spaces**.

Course Content Schedule*.

Week	Dates	Topic	Book Section
1	Jan 9 - 15	Functions and limits	1.4, 1.5, 1.6
2	Jan 16 - 22	Differentiation	2.1, 2.2, 2.4, 2.5 2.6, 2.7
3	Jan 23 - 29	Exponential and logarithmic functions, logarithmic differentiation	4.1, 4.2, 4.3 4.4, 4.5
4	Jan 30 - Feb 5	Trigonometric functions	8.1, 8.2, 8.3, 8.5
5	Feb 6 - 12	Antiderivatives, indefinite integrals, substitution	5.1, 5.2, 5.3
6	Feb 13 - 17	Integrals of trigonometric functions FTC, areas between curves	8.4, 5.4, 5.5
7	Feb 18 - 26	Reading week	
8	Feb 27 - March 5	Solids of revolution, integration by parts, partial fractions	6.1, 6.4
9	March 6 - 12	Improper integrals, multivariate functions, partial derivatives	6.4, 7.1, 7.2
10	March 13 - 19	Optimization, Lagrange multipliers	7.3, 7.5
11	March 20 - 26	Differential equations, separable differential equations	9.1, 9.2
12	March 27 - April 2	First-order linear differential equations	9.3
13	April 3 - 10	Catch up/review	

*The instructor reserves the right to change the course content schedule if he perceives the need. Please check OWL announcements regularly for any changes to this schedule.

Contingency plan for an in-person class pivoting to 100% online learning. In the event of a COVID-19 resurgence during the course that necessitates the course delivery moving away from face-to-face interaction, affected course content will be delivered entirely online, either synchronously (i.e., at the times indicated in the timetable) or asynchronously (e.g., posted on OWL for students to view at their convenience). The grading scheme will not change. Any remaining assessments will also be conducted online as determined by the course instructor.

3. Course Materials

Course Web Site. Various useful supplemental materials, such as homework problems, lecture notes, practice tests, etc are posted on the course OWL site. In addition, there are forums on which students may post questions. Students are responsible for checking the course OWL site on a regular basis for news and updates. This is the primary method by which information will be disseminated to all students in the class.

If you need assistance with the course OWL site, you can seek support on the OWL Help page. Alternatively, you can contact the Western Technology Services Helpdesk. They can be contacted by phone at 519-661-3800 or ext. 83800.

Required Textbook. University of Western Ontario* Custom eBook: Text for MATHS 0110A/B 1225A/B 1230A/B, 2nd Edition. You can purchase it at

https://bookstore.uwo.ca/textbook-search?campus=UWO&term=W2022B&courses%5B0%5D=001_UW/MAT1225B.

Previous texts for this course **are not** suitable as a replacement.

Technical Requirements. Gradescope (https://www.gradescope.ca) will be used as a grading platform for written work in the course. A free account will be created on your behalf, although you will be required to verify the account and change the password during the first week of class. Details regarding the set-up of your account and the submission requirements for your written work will be posted on OWL. It is the responsibility of the student to ensure their work is submitted in the correct format (PDF or PNG.) Submitting work in an improper format may result in your work not being graded, and this cannot form the basis of a regrade request.

Additionally, students will need:

- a laptop or computer;

- a stable internet connection;

- to have installed recent versions of Chrome AND Firefox browsers, a pdf reader, and Zoom on their computer;

- a working microphone and webcam;

- a device for scanning (either a scanner or an app that can be used in conjunction with your device's camera).

4. Assessment Description

The assessments for this course will be as follows.

Assessment	Format	Weight	Date
WeBWork assignments best 8 of 9, equally weighted	WeBWork	10%	Weekly
Written assignments equally weighted	Gradescope	15%	
Midterm	In person	25%	Friday, Feb 17 (tentative) 6:30 pm-8:30 pm
Final exam	In person	40%	TBA
Best of Midterm and Final Exam		10%	

WebWork assignments. The assignments will be available through the "WeBWork" tab of the course OWL site. Each set will contain around 10 problems. Here is a tentative schedule.

Assignment	Release date	Due date
1	Jan 20	Jan 27
2	Jan 27	Feb 3
3	Feb 3	Feb 10
4	Feb 10	Feb 17
5	March 3	March 10
6	March 10	March 17
7	March 17	March 24
8	March 24	March 31
9	March 31	April 7

Written assignments. There will be three written assignments which must be scanned and uploaded to Gradescope for Grading. Students will be given two weeks to complete each assignment. These assignments are designed to complement the topics of the course.

Midterm. It will be 120 minutes in duration and will consist of a mixture of short answer and multiple-choice-style questions. **The midterm will cover all material up to and including all of Week 5**. This will be a closed book test.

Final exam. It will be 180 minutes in duration and will consist of a mixture of short answer and multiple-choice-style questions. The final exam will be scheduled by the registrar during the final exam period. **It will cover all the material you learned in the course**. This will be a closed book exam.

In the event of a health lockdown, tests and examinations in this course will be conducted using a remote proctoring service. By taking this course, you are consenting to the use of this software and acknowledge that you will be required to provide personal information (including some biometric data) and the session will be recorded. Completion of this course will require you to have a reliable internet connection and a device that meets the technical requirements for this service. More information about this remote proctoring service, including technical requirements, is available on Western's Remote Proctoring website at: https://remoteproctoring.uwo.ca.

5. Course policies

Email policy.

- Any email sent to the instructor must include a properly descriptive subject line that consists of **the course number followed by a very brief phrase that summarizes the subject of your message**.

- For privacy reasons, I will not respond to emails from non-uwo.ca addresses.

- Grades are final, non-negotiable and will not be discussed, in any case, via email.

- Provided you follow the email policy, you can expect to receive a response to your message within 48 hours. Response times may be longer depending on the volume of emails received. It is your responsibility to ensure you raise your concerns in a timely manner.

Additional policies.

- All students are expected to engage online in a professional and respectful manner. This includes all interactions with peers, as well as communication between TAs or your Professor. Failure to do so will result in academic discipline.

- Course content created by a faculty member is considered the faculty member's intellectual property; it should not be distributed, shared in any public domain, or sold by a student or other third party without prior written consent of the faculty member.

6. Student Absences

For work totalling 10% or more of the final course grade, you must provide valid medical or supporting documentation to the Academic Counselling Office of your Faculty of Registration as soon as possible. For further information, please consult the University's medical illness policy at https://www.uwo.ca/univsec/pdf/academicpolicies/appeals/accommodationmedical.pdf

The Student Medical Certificate is available at https://www.uwo.ca/univsec/pdf/academicpolicies/appeals/medicalform.pdf Students who have a direct conflict between a test and another academic requirement (i.e. test/class/lab/tutorial), and also students for whom a test conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, should contact the Academic Counselling Office in their Faculty ofRegistration as soon as they become aware of the conflict and not later than two weeks before the test. Students who experience an extenuating circumstance (illness, injury or other extenuating circumstance) sufficiently significant to temporarily render them unable to complete a course component may submit a request for academic consideration to the Academic Counselling office of their Faculty of Registration.

If you are unable to meet a course requirement due to illness or other serious circumstances, please follow the procedures below.

WeBWork assignments. If you miss a WeBWork assignment due to illness, accident, or any other emergency, then it will be the score we drop. You do not need to contact your instructor, submit any documentation, or reveal any private information.

If you miss a second WeBWork assignment, you should submit an academic consideration and email the instructor right away. Only academic considerations that cover the due date of an assignment will be accepted as an excuse for missing the assignment. In this case, your mark will be re-weighted to exclude the missed assignment.

Written assignments. A student who missed a written assignment should submit an academic consideration and email the instructor right away. You will receive an extension of 48 hours to submit your work. Note that your assignment won't be graded unless your academic consideration is approved.

Midterm. If you missed the midterm, you must provide an academic consideration covering the date of the test. In this case, a makeup test will be arranged. If you miss the term test and the corresponding makeup test and have appropriate permission for both, then the final exam will be re-weighted to include the weight of the missed term test.

Final exam. If you miss the Final Exam, please contact the Academic Counselling office of your Faculty of Registration as soon as you are able to do so. They will assess your eligibility to write the Special Examination (the name given by the University to a makeup Final Exam).

You may also be eligible to write the Special Exam if you are in a "Multiple Exam Situation" (e.g., more than 2 exams in 23-hour period, more than 3 exams in a 47-hour period).

Note. Missed work can only be excused through one of the mechanisms above. Being asked not to attend an in-person course requirement due to potential COVID-19 symptoms is not sufficient on its own.

Missing an assignment, the term test, or the final exam will result in a grade of zero unless appropriate permission is sought and granted.

7. ACCOMMODATION AND ACCESSIBILITY

Religious Accommodation. When a course requirement conflicts with a religious holiday that requires an absence from the University or prohibits certain activities, students should request accommodation for their absence in writing at least two weeks prior to the holiday to the course instructor and/or the Academic Counselling office of their Faculty of Registration. Please consult University's list of recognized religious holidays (updated annually) at https://multiculturalcalendar.com/ecal/index.php?s=c-univwo.

Accommodation Policies. Students with disabilities are encouraged to contact Accessible Education, which provides recommendations for accommodation based on medical documentation or psychological and cognitive testing. The policy on Academic Accommodation for Students with Disabilities can be found at https://www.uwo.ca/univsec/pdf/academic_policies/appeals/AcademicAccommodation_disabilities.pdf.

8. ACADEMIC POLICIES

The website for Registrarial Services is http://www.registrar.uwo.ca.

In accordance with policy, https://www.uwo.ca/univsec/pdf/policies_procedures/section1/mapp113.pdf, the centrally administered e-mail account provided to students will be considered the individual's official university e-mail address. It is the responsibility of the account holder to ensure that e-mail received from the University at his/her official university address is attended to in a timely manner.

The use of calculators and other electronic devices during the term tests or final exam is prohibited.

Scholastic offences are taken seriously and students are directed to read the appropriate policy, specifically, the definition of what constitutes a Scholastic Offence, at the following Web site http://www.uwo.ca/univsec/pdf/academic_policies/appeals/scholastic_discipline_undergrad.pdf.

Computer-marked multiple-choice tests and exams may be subject to submission for similarity review by software that will check for unusual coincidences in answer patterns that may indicate cheating.

9. Support Services

Please visit the Science & Basic Medical Sciences Academic Counselling webpage for information on adding/dropping courses, academic considerations for absences, appeals, exam conflicts, and many other academic related matters: https://www.uwo.ca/sci/counselling/.

Please contact the course instructor if you require lecture or printed material in an alternate format or if any other arrangements can make this course more accessible to you. You may also wish to contact Accessible Education at (519) 661-2147 if you have any questions regarding accommodations.

Learning-skills counsellors at the Student Development Centre (http://www.sdc.uwo.ca) are ready to help you improve your learning skills. They offer presentations on strategies for improving time management, multiple-choice exam preparation/writing, textbook reading, and more. Individual support is offered throughout the Fall/Winter terms in the drop-in Learning Help Centre, and year-round through individual counselling.

Students who are in emotional/mental distress should refer to Mental Health@Western (http://www.health.uwo.ca/mentalhealth) for a complete list of options about how to obtain help.

Additional student-run support services are offered by the USC, http://westernusc.ca/services.