

# MATH 100: DIFFERENTIAL CALCULUS WITH APPLICATIONS

The University of British Columbia  
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## ACKNOWLEDGEMENT

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the x<sup>w</sup>məθk<sup>w</sup>əyəm (Musqueam). The land it is situated on has always been a place of learning for the Musqueam people, who for millennia have passed on culture, history, and traditions from one generation to the next.

If you would like to know more about the joint history of UBC and Musqueam, one place to start is at UBC's Indigenous portal.

## COURSE DESCRIPTION

Course Title	Course Code Number	Credit Value
Differential Calculus with Applications	MATH 100	3

MATH 100 involves both topics from differential calculus. Students will learn derivatives of elementary functions, applications and modelling including graphing and optimization with real-life applications.

## CONTACTS

Do not email your instructor directly with questions, there are many people contributing to the delivery of this course and they can be reached via different channels. Your issue will be resolved more quickly if it is directed to the correct communication channel, a brief list of some of the issues handled by each channel has been provided:

- Instructor office hours - questions related to Written Assignment and Test grading; questions regarding content covered in large and small classes; general math questions.
- Piazza - Questions related to Written Assignment and WeBWorK assignment problems; questions not unique to individual students
- Calculus Contact form - Questions relating to course policy that require personal information; requests for concession, accommodation, or CfA letters of accommodation; requests for Written Assignment and Test regrades (please follow instructions in the Regrades section).

The calculus contact form can be found on Canvas or [here](#).

For instructor office hours, please see Canvas.

The large class and small class instructor for this course is Dr. Peter Harrington

## **COURSE STRUCTURE**

Most weeks, you will attend one 2-hour lecture and one 1-hour small class. There will be group work during small classes, attendance is mandatory.

This is an in-person course, all students are expected to be present on campus for their registered small classes, large classes, and final exams. Large class section 2AR is an exception to this rule, and is delivered online; students enrolled in this section must still attend their small classes and final exam in person.

## **LEARNING MATERIALS AND TEXTBOOKS**

Our course materials are linked to UBC's learning management system, Canvas.

This course uses the CLP-1 Differential Calculus textbook. You can find a book of practice problems in the second link on the same page. This is a free online textbook created by UBC professors for UBC students; there are no physical copies available but the PDF file is easily printable (given the link, copy shops will print and bind).

Students are expected to have regular access to a computer and the internet, WeBWorK assignments and Written Assignments will be submitted via Canvas or WeBWorK. Assignments submitted via other means, i.e. email, will not be accepted.

# GRADING AND EVALUATION

Your course grade will be calculated as follows:

**10%** WeBWorK assignments

**10%** Written Group Assignments

**30%** Tests (15% each)

**10%** Engagement

**40%** Final exam

For a full description of the final exam regulations, see the UBC Calendar page on Student Conduct during Examinations. Unless specifically stated otherwise, notes, calculators, cell phones and other electronic devices are strictly prohibited from use during the exam. This includes use of cell phones for checking the time.

## 0.1 WeBWorK: assignments and quizzes

There are 11 WeBWorK assignments. Only your top 10 WeBWorK assignments will be considered when calculating your provisional grade; this is intended to account for technical difficulties, illness, and other personal situations. WeBWorK assignments are due on Fridays. These assignments make up 10% of your initial grade. Only your highest attempt will be counted.

WeBWorK assignments are used to achieve technical and computational mastery.

WeBWork questions come in a number of different formats, and some questions will require you to type out an exact answer in order for the question to be correct. These answers are not always numbers, so making a typo could cost you marks. It is suggested that you click the PREVIEW ANSWERS button before you submit your work. If you have questions about formatting while you are doing your assignments or practicing, ask them on Piazza.

## 0.2 WRITTEN ASSIGNMENTS

There are four written group assignments. They will make up 10% of your initial grade. Group assignments are meant to explore and extend core concepts. Make sure to start early: it is not unusual to spend up to 12 hours on an assignment. Assignments are graded on clarity and coherence as well as correctness. They must be well written and clearly presented.

It is expected and encouraged for your group to work with other groups on these assignments. However, your group must write up its assignment independently, and any ideas inspired by discussions with students outside your group must be acknowledged in your submission.

Collaboration and communication is a part of learning mathematics, as such students are largely expected to resolve group issues themselves, although major group issues can be reported via the Calculus Contact Form, and should be done as early as possible in the semester.

### 0.3 TESTS

There are two tests in MATH 100, they will both be written individually, not in groups. All information required to successfully sit the tests will be published on the Canvas “Tests” page.

### 0.4 ENGAGEMENT

Engagement is worth 10% of your final grade.

**Engagement in small classes:** Engagement means not only attendance, but active participation: asking and answering questions, contributing in team problem solving, and refraining from unrelated activities (e.g. checking your phone). You may skip one small class without penalty, this is intended to account for illness and other personal situations; otherwise you will lose 1 engagement point for every small class you are absent.

**Engagement on reflection questions:** Each written assignment includes one reflection question. Reflection is an important ingredient of success, especially given the significant differences between high school and university-level mathematics. You will lose 1 engagement point for every reflection question you do not answer.

**Diagnostic test:** This is a test written on WeBWork to ensure you can access the necessary resources and navigate the WeBWork assignments. You will lose 1 engagement point if you do not submit an answer for every question on the diagnostic test.

**Other engagement requirements and bonuses:** There may be other engagement requirements throughout the term. Failing to complete these requirements will result in a penalty. Instructors may also give bonus engagement marks for extraordinary contributions.

### 0.5 FINAL EXAM

The final exam is an evaluative assessment of your understanding of the course material. All information required to sit the final exam will be published on Canvas or made available on the SSC later in the semester.

## IMPORTANT DATES

### MIDTERM EXAMS:

Test 1: TBD

Test 2: TBD

### FINAL EXAM:

The final exam date and time will be finalized during the semester and can be accessed via the Student Service Centre (SSC). Please do not make travel arrangements prior to its release.

### OTHER DATES

Midterm Break: February 19th - 23rd

Last day to drop without a “W” standing: January 19th

Last day to withdraw with a “W” standing: March 1st

## Topics

In this course we will cover the following topics:

- Comparing power, log, exponential and trigonometric functions; basic sketching
- Rational functions; horizontal and vertical asymptotes; the language of limits; continuity
- Definition and interpretation of the derivative; tangent lines; linear approximations; the exponential function and simple differential equations
- The power, product and quotient rules; derivatives of trigonometric functions
- The chain rule; the derivative of  $\log(x)$  and logarithmic differentiation
- Implicit differentiation and inverse trigonometric functions; related rates;
- Curve sketching; the logistic model
- Higher degree approximations; geometric series; differential equations: phase diagrams; ansatzes
- Optimization
- Phase diagrams; ansatzes; revisiting the logistic model
- Computation week: numerical derivatives; Euler’s method, Newton’s method
- Introduction to multivariable functions, partial derivatives, second order partials; sketching in 3D; Local max and min, absolute max and min of multivariable functions

## POLICIES AND RESOURCES TO SUPPORT STUDENT SUCCESS

UBC provides resources to support student learning and to maintain healthy lifestyles but recognizes that sometimes crises arise and so there are additional resources to access including those for survivors of sexual violence. UBC values respect for the person and ideas of all members of the academic community.

Harassment and discrimination are not tolerated nor is suppression of academic freedom. UBC provides appropriate accommodation for students with disabilities and for religious, spiritual and cultural observances. UBC values academic honesty and students are expected to acknowledge the ideas generated by others and to uphold the highest academic standards in all of their actions. Details of the policies and how to access support are available [here](#).

Information on general course policies including resources can be found [here](#).

## ACADEMIC POLICIES

This is a long-winded and exhaustive description of the academic policies governing this course. It complements the usual academic policies governing all courses at UBC (here).

### LATE SUBMISSIONS & MISSED ASSESSMENTS

Written Assignments will be accepted up to 24 hours after the submission deadline, assignments submitted during this window are subject to a 15% penalty. Written Assignments will not be accepted more than 24 hours after the submission deadline. Written Assignments are completed in groups over multiple weeks, if you are unavoidably unable to contribute to your group's written assignment you should inform your group members; if a member of your group is unable to contribute for a valid reason you should not list them as non-contributing.

WeBWorK assignments will not be accepted after the submission deadline. Only the top 10 of the first 11 WeBWorK assignments are considered in the calculation of your final grade, this is to account for illness, injury and other personal circumstances that inevitably befall students every semester preventing you from completing an assignment.

Tests are written in-class. If you are unwell or other personal circumstances create a substantial and unavoidable obstacle in writing the tests, do not write the test, instead requesting concession via the Calculus Contact Form. If you are absent during a test day for a valid reason, (described in IN-TERM CONCESSIONS) you should submit a request through the Calculus Contact Form.

It should be noted that assignment extensions are not concessions that will be offered in this course. Alternative test sitting dates are rarely offered, the requisite circumstances are outlined in IN-TERM CONCESSIONS.

### IN-TERM CONCESSIONS

Requests for in-term concessions are to be directed to the Calculus Contact Form and will be treated in accordance with the UBC senate rulings for academic concession. Grounds for academic concession may exist when a student's personal circumstance unexpectedly or unavoidably hinders or prevents them from fulfilling the requirements of a course in a timely manner.

Concessions for missed assessments are considered and offered on a case-by-case basis, no two students will be undertaking the academic load of this course in the same way, and as such require different consideration; a friend or fellow class member receiving concession for an assessment does not guarantee the same or any concession will be offered to you.

Requests for concession must be delivered in a reasonable time, unreasonably late requests will be deferred to your governing faculty.

Concessions cannot be offered to students where grounds for concession depend upon long-term conditions (i.e. chronic injuries, illnesses, or mental health conditions, etc.) without endorsement from the student's governing faculty or the Centre for Accessibility (CfA).

**Written Assignments** in general are not eligible for concession, these are completed in groups and it is expected that members will be able to complete assignments despite absence of contribution from 1-2 other members. Dire circumstances are requisite for receiving concession on Written Assignments, in general do not expect to receive concession for Written Assignments. The standard concession offered for eligible Written Assignments is a shifting of the weight of the Written Assignment to the final exam.

**WeBWorK assignments** are completed online, and can be completed from anywhere, again dire circumstances are required to receive concession on WeBWorK assignments. The standard concession offered for eligible WeBWorK assignments is a shifting of the weight of the missed WeBWorK assignments to the final exam.

**Tests** are a major assessment in this course, each worth 15% of your final grade. If you are absent for a valid reason for one test, the standard concession is to shift the weight of that test to the final exam. If you are absent for a valid reason for both tests you will be asked to speak with your governing faculty and consider a late withdrawal; pending faculty endorsement you may be offered additional concessions.

The **Final Exam** for this course is a major assessment, however instructors nor staff in the Math department can grant concession for this assessment. Similarly to the **Tests** if you are unwell or other personal circumstances create a substantial and unavoidable obstacle in writing the final exam, do not write the final exam, instead contact your faculty's advising office as soon as possible. Obtaining a Standing Deferred (SD) status in MATH 100 is the only concession available for the **Final Exam**, read more about standing deferred status here. The process for obtaining an SD status in MATH 100 is more rigorous than for other in-term concessions; be prepared to provide documents supporting your request.

## MISSED CLASS POLICY

It is expected you will attend all Large Classes, however if you are absent for a Large Class you do not have to inform anyone of your absence, it is expected that you will be responsible for your own learning and catch up on the material missed in your own time; helpful resources such as lecture notes (or for some sections recordings) are posted on Canvas. You can also attend office hours to help understand any missed material more clearly.

It is expected you will attend all Small Classes, if you are absent for a valid reason you should make a request via the Calculus Contact Form, stating which small class you missed and briefly describing why you were absent. Supporting documents are not required for the first occurrence of illness that are likely to resolve themselves quickly; if it is not the first occurrence or the illness is unlikely to resolve itself quickly concession cannot be provided by instructors or staff, you will be directed to contact your faculty's advising office.

All students can be absent from one small class without consequence, this small class, despite not appearing as 'excused' in the Canvas Gradebook, will not affect your engagement score for this class. This policy of forgiving one absence is intended to ease administrative burden and will be used to account for the first instance of illness, injury or other personal circumstance that prevents you from attending class.

## REGRADE REQUESTS AND INCORRECT GRADES

Regrade requests should be submitted via the Calculus Contact Form for all assessments except the Final Exam.

Regrade requests for **Written Assignments** can be submitted up to 48 hours after the marked assignment is returned. You should submit a request via the Calculus Contact Form.

Regrade requests for **WeBWorK Assignments** will not be accepted, if an error exists in a WeBWorK question you should check Piazza for a post that describes the error, or if no post exists you should create one describing the error.

The process for requesting a regrade on **Tests** is described on the "Tests" page on Canvas.

Requesting a regrade of the **Final Exam** is a formal process requested via enrolment services, known as a

review of assigned standing; a more complete description of the process is provided here. It is recommended that you request a viewing of your final exam prior to requesting a review of assigned standing, to request a viewing of your final exam you can submit a request via the Calculus Contact Form.