UBC Math 100

2022 WT1

Acknowledgement

UBC's Point Grey Campus is located on the traditional, ancestral, and unceded territory of the xʷməθkʷəy̓əm (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 on this site.

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 Information

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

MATH 100 involves both topics from differential calculus as well as multi-variable calculus. Students will learn the basic ideas, tools and techniques that they can use to solve problems with real-life applications.

Contacts

Do not email your instructor directly with questions. You are encouraged to attend office hours or ask questions during lectures and especially small classes. Please use the Calculus Contact Form for any issues or questions regarding personal matters. This form can be found on your class Canvas site or here.

Questions concerning the course and homework can be asked on Piazza. The Math Learning Centre is also available for additional homework help.

For office hours, please see Canvas → sections.

Other Instructional Staff

We also have TAs who will moderate Piazza. Small section instructors will also hold regularly scheduled office hours.

Course Structure

There are three "flavours" of MATH 100, each with different applications.
Flavour "A" includes applications to Physical Sciences and Engineering.
Flavour "B" includes applications to Biology and Life Sciences.
Flavour "C" includes applications to Commerce and Social Sciences.
All flavours share the same homework and exams, and each large class will learn the same material. The instructors coordinate to teach roughly the same topics at roughly the same time. The differences are in the small classes, where each section may be taught examples of applications for their respective flavours.

Each student is registered in both a large class and a small class. The small classes are more personal and involve group-work. Your attendance is expected at the small classes; in addition to affecting your own understanding, your absence disturbs your group.

All students will have access to the recordings from the online section (section 1AR).

Schedule of Topics

Lectures will naturally diverge somewhat from any schedule, so the schedule below may change slightly. We will plan Assignment 1 to cover topics listed below in Week 1, Assignment 2 to cover Week 2, etc.

Your classes begin with your large class in the second week of school

First class for Flavour A → Tuesday September 13

First class for Flavour B → Wednesday September 14

First class for Flavour C → Thursday September 15

Your first small class will take place after your first large class

Small classes for Flavour A start → Wednesday September 14

Small classes for Flavour B start → Thursday September 15

Small classes for Flavour C start → Friday September 16

Double check your course schedule to make sure you go to the correct class/lecture

Week	Topics
September 6	No Class
September 13	Comparing power, log, exponential and trigonometric functions; parse trees; basic sketching
September 20	Rational functions; horizontal and vertical asymptotes; the language of limits; continuity
September 27	Definition and interpretation of the derivative; tangent lines; linear approximations; the exponential function and simple differential equations
October 4	The power, product and quotient rules; derivatives of trigonometric functions
October 11	The chain rule; the derivative of log(x) and logarithmic differentiation; implicit differentiation and inverse trigonometric functions; related rates
October 18	Higher degree approximations; curve sketching
October 25	Optimization
November 1	Differential equations: phase diagrams; ansatzes
November 7	Nov. 7 - 11 Midterm Break
November 15	Computation week: numerical derivatives; Euler's method
November 22	Introduction to multivariable functions, partial derivatives, second order partials; sketching in 3D
November 29	Local max and min, absolute max and min

Learning Materials

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). At the end of the course, we will also refer to a few sections of the CLP-derived OIL textbook. We will occasionally refer to Differential Calculus for the Life Sciences.

Assessments of Learning

Grade Calculation

Any changes will be communicated to the class. Changes are not taken lightly, so we will stick with the plan below unless circumstances cause it to be impractical.

5% WeBWorK assignments
15% WeBWorK quizzes
20% Written Group Assignments

10% Participation and Practice Exams
50% Final exam
Adjustment See Benchmark Requirements below.

All failing grades are double-checked before they are submitted. Final exams are not returned, but if you would like to view yours, you need to fill out the exam viewing form on the math department website.

WeBWorK: assignments and quizzes

There are 10 WeBWorK assignments. The score of your lowest WeBWorK assignment will be replaced with a perfect score when calculating your final grade; this is intended to account for technical difficulties, illness, and other personal situations. WeBWorK assignments are due on Thursdays.

WeBWorK assignments are more formative than evaluative. WeBWorK focuses on the computational learning goals of the course. This is tested in Section 1 of the final exam. Section 1 consists of questions closely aligned to WeBWorK assignments.

Because it is possible to keep trying a question until you get it right, without really understanding how the question works, each assignment is followed by a quiz. Quizzes differ from assignments in that you only have one chance to submit your answer, so practice good entry habits on the homework to prepare.

There are 10 WeBWorK quizzes. The score of your lowest WeBWorK quiz will be replaced with a perfect score when calculating your final grade; this is intended to account for technical difficulties, illness, and other personal situations. WeBWorK quizzes are generally run on Fridays. Once a quiz is started, your must submit your quiz within the allotted time – normally 30 minutes. You may attempt the quiz multiple times within the week that the quiz is open, but there is a 12 hour cool-down period between each attempt. .

Each WeBWorK quiz is a random selection of questions from the associated homework assignment. In order to start the quiz, you must enter the access code "100quiz" (without the quotation marks). In order to submit the quiz, you must press the "Grade Test" button at the bottom of the quiz page. You must do this before the timer at the top of the quiz page reaches 0. Do not press this button before you wish to submit. Pressing the "Preview" button will save your work up to that moment.

Written Group Assignments

Your participation in the small sections is mandatory.

There are five written group assignments. Group assignments are meant to explore and extend core concepts. Assignments are graded on clarity and coherence as well as correctness. They must be well written and clearly presented. Section 2 of the final exam includes questions based on written group assignments.

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.

Participation and Practice Exams

There are two components to participation.

The first component is two practice exams, each worth 3% of your final grade. Practice exams are designed to be similar in difficulty to the final exam. In order to receive full marks, you must complete the practice exam under exam conditions, and then scan and upload it. Take the practice exams very seriously. They constitute an authentic "field test" of your abilities, and are the best way to determine if you are prepared.

The second component is general participation. Throughout the term, attendance will be taken. You may also be asked to complete participation tasks, such as presenting a solution in your small class. If you complete these tasks and your attendance is perfect, you will receive full marks for general participation.

Final Examination

You must achieve a grade of 40% on the final exam and 60% on Section 1 in order to pass the course. Section 1 consists of 10 questions, worth 20 marks, closely aligned to WeBWorK assignments. Section 2 consists of 6-8 more challenging questions, worth 30 marks, based on lectures, small classes and written group assignments.

The final examination will take place at a time and place determined by the university. Usually the date is not known until midway through the semester. (It is important that you do not make travel plans that might conflict with the final exam.) The final exam is cumulative, covering material from the entire term.

Benchmark Requirements

We believe that mastering technical skills, those tested in the WebWork Assignments and Quizzes, is an essential component of this calculus course. To ensure that you master these technical skills, we have implemented the following benchmark system that you must meet in order to receive certain grades.

Quiz Benchmarks

One week after each quiz closes, an optional retry will open, and will remain open, with unlimited attempts, until the end of the term. Retry grades will not affect your quiz grade.

If you have a perfect score on 9 quizzes or retries, your benchmark grade is 100%.

If you have a perfect score on 8 quizzes or retries, your benchmark grade is 79%.

If you have a perfect score on 7 quizzes or retries, your benchmark grade is 67%.

If you have a perfect score on 6 quizzes or retries, your benchmark grade is 54%.

If you have a perfect score on 5 quizzes or retries, your benchmark grade is 45%.

Exam Benchmarks

If you score lower than 16/50 on Section 1 of the final exam, your benchmark grade is 45%.

If you score between (or exactly) 16/50 and 25/50 on Section 1 of the final exam, your benchmark grade is 54%.

If you score greater than 25/50 on Section 1 of the final exam, your benchmark grade is 100%.

This means if your benchmark grade is lower than your initial grade, your final mark in the class will be the benchmark grade..

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.

Assigning Marks

Assessments fall into two categories: formative and evaluative. A formative assessment is meant to help you learn something. Weekly WeBWorK assignments are good examples of this. Completing them should help you develop your understanding of course content. The final exam, on the other hand, isn't there to teach you — its role is to evaluate your understanding.

The points attached to formative assessments are an inducement for you to try hard while you're studying, and then to pay attention to the feedback you receive.

Points on an evaluative assessment are good-faith attempts to certify student understanding. Keep this in mind when you're writing your exams: coming up with a correct final answer is only a consequence of you demonstrating that you know how to solve problems in general. So, the final answer is often less important than the steps you took to get there.

If you come across a fact from outside of class that makes a question trivial, using it may give you a correct answer, but it won't demonstrate that you've learned what we've been teaching, so it may not get you full credit. Similarly, writing something correct and then stopping shows better understanding than writing something correct and then following it with something incorrect.

Regrading

If you find a marking error on returned work, you can request a regrade for 2 weeks following the return of the assignment. Fill out the Calculus Contact Form explaining the mistake. Be sure to include enough information for the markers to easily find which part of the assignment you're talking about, and what you think has gone wrong. Your assignment may be regraded in part or in full; marks may go up, go down, or stay the same.

WeBWorK marks questions wrong if they are entered with incorrect syntax. This is **not** a grading error.

Assignments before the final exam have strong formative components: the assignments are there, in large part, for you to learn from. Reviewing your work in a timely manner is an important part

of this process. Furthermore, extended grading hurts consistency. When grading a large number of papers, common themes often emerge, which should be given the same mark. As time passes, even with written rubrics, graders forget exactly how they weighted different things. So, enforcing a time limit has two benefits: it encourages good learning habits for students, and safeguards the consistency of the marking.

Simplification

Simplification of your answers in an assessment should reflect a cost/benefit analysis, and is context-dependent.

WeBWorK accepts calculator-ready answers. So, you should write (say) "`12e^(sin 5)`" rather than using a decimal approximation. This is the preferred way to enter answers into WeBWorK, because it needs a high degree of accuracy to accept your answer.

In a timed assessment (the midterm and final exam), make a cost-benefit analysis. If something can be written much simpler with very little work, do that. If you leave the term $\ln 1$ unsimplified, we will assume you do not know that it is equal to zero. Zero is much clearer, and it should take you no time at all to use it instead of a logarithm. On the other hand, suppose you come up with an answer of $\frac{627}{1463}$. A simpler form would be $\frac{3}{7}$, but finding that form would take a while. We sympathize, and would not expect you to simplify this unless we specifically instructed you to. The cost is too high (in a timed environment) to justify the benefit.

Similarly, leaving answers with terms like $\frac{100}{10}$, $\ln(e^2)$, $e^{\ln 2}$, $\sqrt{x^4y^6}$, $\frac{1}{x^{-1}}$, $\sin\left(\frac{\pi}{2}\right)$, $\arctan(0)$, $\sin(\arccos(1))$, etc. will cause us to question your understanding. You should be able to simplify these quickly and easily to forms that are much, much clearer. (If not, review your notes from previous classes, or the precalculus review course on Canvas.)

Concessions

Concessions are handled slightly differently for different components of the course.

WeBWorK In previous years, when there were issues warranting a concession (technical problems, illness, family obligations, late registration, etc), students would contact their instructor to have the relevant assignment excused. In order to reduce this administrative burden, the score of your lowest WeBWorK assignment and lowest WeBWorK quiz will be replaced with a perfect score. This is not intended as a grade-giveaway. It is intended to mitigate the paperwork involved in excusing assignments. It also avoids asking instructors and students to decide whose circumstances warrant exceptions. No late assessments are accepted.

Use the Calculus Contact Form if circumstances beyond your control, such as illness or extended family emergencies, cause you miss more than one WeBWorK assignment, or more than one quiz. You might also want to be in touch with your faculty advising office to let them know about your situation.

Small Class Attendance Students are strongly encouraged to attend all small classes as you will have group members relying on you for your group work assignments. These classes are also

where you will earn your participation points, either through attendance or answering questions presented by your instructor. If, however, you must miss a class, participation marks from one small class will automatically be dropped for each student. You do not need to contact anyone to let them know you will miss a class.

Final exam The final exam is the most formal assessment, and subject to specific university regulations. Students unable to write the final exam must contact their faculty advising office.

Scaling

Term marks may be scaled, and the scaling may differ between sections. No scaling will be finalized until all assessments are marked. Because WeBWorK assignments historically have high averages that are not necessarily reflective of actual mastery, exams are written to have a lower average.

Average marks for assessments are not always shared with students. If you are unhappy with your mark, rather than comparing it to your classmates, consult with your instructor about ways to improve your studying.

Sections will not necessarily be scaled so their averages match other sections. Differences between sections are often an indirect consequence of their meeting times.

Other Course Policies

General Syllabus Info

Information on general course policies including resources can be found here