Mathematics 1110H – Calculus I: Limits, Derivatives, and Integrals
TRENT UNIVERSITY, Fall 2025

Instructor

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Dept. of Mathematics & Statistics

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Prerequisite: Grade 12U *Advanced Functions* or equivalent with at least 60%.
Strongly Recommended: Grade 12U *Calculus and Vectors* or equivalent.

Text: *Single Variable Calculus* (Early Transcendentals), by David Guichard, 2025, licensed under the Creative Commons BY-NC-SA License. Download from: www.whitman.edu/mathematics/multivariable/ The text will occasionally be augmented by handouts on particular topics.

Meetings

Lectures: Mondays 08:00-08:50, Tuesdays 16:00-16:50, and Fridays 10:00-11:50, all in SC 137.
Workshops: Weekly, starting in the week of Monday, 8 September. For the time and location for your section, please consult your schedule.
Labs: Initially weekly, starting in the week of Monday, 8 September. (We may switch to having the labs fortnightly later on.) For the time and location for your section, please consult your schedule.

Marking Scheme

There will be at least five fortnightly in-person tests, normally written in the workshops, at least four fortnightly assignments (due in alternate weeks with the tests), and an in-person final exam, weighed as follows in the final mark:

Best 4 tests (8% each)	32%
Best 4 assignments (8% each)	32%
Final examination	36%

Please note that work worth at least 25% of the course work should be completed, marked, and returned by the final date (Tuesday, 4 November) to withdraw from the course. Students who miss a test or assignment for reasons beyond their control should contact the instructor as soon as possible. Note that the weekly assignments will usually require the use of SageMath mathematics software.

This scheme may be modified for individual students in *exceptional* circumstances, such as a lengthy absence due to illness. Any such modification will require the agreement of both the student and the instructor.

Content and Learning Outcomes

MATH 1110H is an introduction to the concepts and techniques of differential and some integral single-variable calculus, with some applications to other areas of mathematics and science. Upon successful completion of this course, a student should be able to:

1. Compute limits of functions, using both direct (*e.g.* algebraic) and indirect (*e.g.* squeeze-play) methods.
2. Determine where and whether functions are continuous, and identify and classify points of discontinuity.
3. Differentiate a wide class of single-variable functions, including polynomials, algebraic functions, trigonometric functions, exponential and logarithmic functions, and sums, products, quotients, compositions, and inverses of these functions. Integrate such functions using methods up to and including substitution.
4. Use the first and second derivatives and asymptotics of a function to obtain qualitative information about that function, such as intervals of increase or decrease, concavity, maxima and minima, existence and uniqueness of roots. Use this information to sketch the graph of the function.
5. Use derivatives to solve applied problems involving rate-of-change, linear approximation, and optimization. Understand the meaning of core calculus concepts in simple applications to physics, engineering, economics, biology, and other sciences.
6. Use integration to compute areas under curves and the volumes of rotationally symmetric solids.
7. Have sufficient abstract conceptual understanding of continuity, derivatives, integrals, and antiderivatives to can understand the main ideas in the proofs of some of the classical results of calculus (*e.g.* the Mean Value and Squeeze Theorems) and understand and use the statements of others (*e.g.* the Fundamental Theorem of Calculus).

Schedule

In terms of content, this schedule should be taken with a grain of salt: no lesson plan survives contact with students unchanged. We will speed up or slow down, and perhaps rearrange some material, depending on how things go. Please note that while we will not fully cover the content of every chapter, we will from time to time cover bits of material that are not in the textbook. In particular, most of the assignments will require use of mathematical software, namely `SageMath`.

Weeks 0-1. *(4-12 September)* Chapters 1–2: Functions, limits, continuity. *Classes begin on Thursday, 4 September. The first class in MATH 1110H is on Friday, 5 September.*
Weeks 2-3. *(15-26 September)* Chapters 2–3: Limit definition of the derivative, properties of derivatives, some derivatives of commmon functions. Assignment #1 due on Friday, 19 September; Test #1 on Friday, 25 September.
Weeks 4-5. *(29 September – 10 October)* Chapters 3–4: Product, Quotient, and Chain Rules for derivatives, trigonometric functions. Assignment #2 due on Friday, 3 October; Test #2 on Friday, 10 October.
Weeks 6-7. *(13-17 October & 27-31 October)* Chapters 4–5: Exponential, logarithmic, and hyperbolic functions, curve sketching. Assignment #3 due on Friday, 17 October; Test #3 on Friday, 31 October. *University closed on Thanksgiving Day, Monday, 13 October. No class during* **Reading Week, 20-24 October.**
Weeks 8-9. *(3-14 November)* Chapter 6: applications of differentiation, optimization. Assignment #4 due on Friday, 7 November; Test #4 on Friday, 7 November. *The last date to drop this course without academic penalty is Tuesday, 4 November.*
Weeks 10-12. *(17 November – 3 December)* Chapters 7–8: Integrals, the Fundamental Theorem of Calculus, techniques of integration, applications of integration. Assignment #5 due on Friday, 21 November; Test # 5 on Friday, 28 November. *Wednesday, 3 December, is the last day of classes.*
Examination Period. *(5-19 December)* Exam schedule to be determined.

Academic Integrity

> *Academic dishonesty, which includes plagiarism and cheating, is an extremely serious academic offence and carries penalties varying from failure on an assignment to expulsion from the University. Definitions, penalties, and procedures for dealing with plagiarism and cheating are set out in Trent Universitys Academic Integrity Policy. You have a responsibility to educate yourself – unfamiliarity with the policy is not an excuse. You are strongly encouraged to visit Trents Academic Integrity website to learn more:* `www.trentu.ca/academicintegrity`

For clarity, the following guidelines will apply in MATH 1110H:

> You are permitted and encouraged to work with others and ask anyone willing (especially the instructor!) for explanations, hints, and suggestions on the assignments, and to consult whatever sources you wish. However, **all work submitted for credit must be written up entirely by yourself, giving due credit to all relevant sources of help and information. For the tests and final exam, you may not give or receive any help**, nor use any aids except for a calculator (any that you like that can't communicate wirelessly) and an aid sheet (one letter- or A4-sized sheet with whatever you want on it on all sides), except with the instructor's express permission or as mandated by Student Accessibility Services.

Access to Instruction

> *It is Trent University's intent to create an inclusive learning environment. If a student has a disability and documentation from a regulated health care practitioner and feels that they may need accommodations to succeed in a course, the student should contact the Student Accessibility Services Office (SAS) at the respective campus as soon as possible.*

Calculus Archive Page

An archive page at `euclid.trentu.ca/math/sb/calculus/` has a lot of useful material from past iterations of first-year calculus taught by your instructor. Current material will be posted to Blackboard.

Last modified 2025-07-30.