Mathematics 1110H – Calculus I: Limits, Derivatives, and Integrals
TRENT UNIVERSITY, Summer 2023 (S61)

Instructor

Stefan Bilaniuk (pronounced Стефан Біланюк)
office: ENW 337
hours: Mondays & Wednesdays 12:00-12:50,
or by appintment, or just drop by.
phone: 705 748-1011 x7474
e-mail: `sbilaniuk@trentu.ca`
home: 705 742-7862 [Do *not* call between 9 p.m. and 8 a.m. unless it's an emergency.]
web: `http://euclid.trentu.ca/math/sb/`

Department of Mathematics

Colleen Berrigan
office: SC 327
hours: Weekdays 08:00-16:00
phone: 705 748-1011 x7715
e-mail: `math@trentu.ca`

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, 2022, licensed under the Creative Commons BY-NC-SA License. May be downloaded for free from:
`www.whitman.edu/mathematics/multivariable/`

Meetings

Lectures: Mondays & Wednesdays 09:00-11:50 in ENW 111.
Labs/Seminars: Mondays & Wednesdays 13:00-13:50 in ENW 105.

Marking Scheme

There will be ten quizzes (which will be 24-hour online mini-assigments), six weekly assignments, an in-person midterm test, and an in-person final examination, weighed as follows in the final mark:

`Best 9 quizzes (2.5% each)`	`22.5%`	`Best 5 assignments (6.5% each)`	`32.5%`
`Midterm test`	`12%`	`Final examination`	`33%`

Please note that work worth at least 25% of the course should be completed, marked, and returned by the final date (Monday, 29 May) to withdraw from the course. Students who miss a quiz 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` or equivalent 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).

Calculus Archive Page

All current course materials will be posted to Blackboard. It will also be posted, usually with a slight delay, to an archive page at `euclid.trentu.ca/math/sb/calculus/` , which also has a lot of useful material from past iterations of first-year calculus courses taught by your instructor.

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 is not in the textbook. In particular, most of the assignments will likely require use of `Sagemath` or similar software.

Week 0. *(3-5 May)* Chapters 1–2: Functions, limits, continuity. *Classes begin on Wednesday, 3 May.*
Week 1. *(8-12 May)* Chapters 2–3: Limit definition of the derivative, properties of derivatives, some derivatives of commmon functions. Quiz #1 on Tuesday, 9 May; Quiz #2 on Thursday, 11 May; Assignment #1 due on Friday, 12 May.
Week 2. *(15-19 May)* Chapters 3–4: Product, Quotient, and Chain Rules for derivatives, trigonometric functions. Quiz #3 on Tuesday, 16 May; Quiz #4 on Thursday, 18 May; Assignment #2 due on Friday, 19 May.
Week 3. *(22-26 May) University closed on Monday, 22 May: Victoria Day. No class!* Chapters 4–5: Exponential, logarithmic, and hyperbolic functions, curve sketching. Quiz #5 on Thursday, 25 May; Assignment #3 due on Friday, 26 May.
Week 4. *(29 May – 2 June)* Chapter 6: applications of differentiation, optimization. Test written in lab on Monday, 29 May; Quiz #6 on Tuesday, 30 May; Quiz #7 on Thursday, 1 June; Assignment #4 due on Friday, 19 May. *The last date to drop this course without academic penalty is Monday, 2 June.*
Week 5. *(5-9 June)* Chapters 7–8: Integrals, the Fundamental Theorem of Calculus, techniques of integration. Quiz #8 on Tuesday, 6 June; Quiz #9 on Thursday, 8 June; Assignment #5 due on Friday, 9 June.
Week 6. *(12-13 June)* Chapters 8–9: Techniques of integration, applications of integration. Quiz #10 on Tuesday, 13 June. *Tuesday, 13 June, is the last day of classes.*
Examination Period. *(14-18 June)* Assignment #6 due on Wednesday, 14 June. Exam schedule to be announced.

Academic Integrity

> *Academic dishonesty, which includes plagiarism and cheating, is an extremely serious academic offence and carries penalties varying from a 0 grade on an assignment to expulsion from the University. Definitions, penalties, and procedures for dealing with plagiarism and cheating are set out in Trent University's Academic Integrity Policy. You have a responsibility to educate yourself – unfamiliarity with the policy is not an excuse. You are strongly encouraged to visit Trent's 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 quizzes and 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 test 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), except with the instructor's express permission.

Access to Instruction

> *It is Trent University's intent to create an inclusive learning environment. If a student has a disability and/or health consideration and feels that he/she may need accommodations to succeed in this course, the student should contact the Student Accessibility Services Office (SAS), Blackburn Hall Suite 132, 705 748-1281,* `sas@trentu.ca`*. For Trent University in Oshawa Student Accessibility Services Office contact 905 435-5102, ext. 5024. Complete text can be found under Access to Instruction in the Academic Calendar.*

Last modified 2023-04-29.