Mathematics 1110H – Calculus I: Limits, Derivatives, and Integrals

TRENT UNIVERSITY, Fall 2018 *[In Peterborough!]*

Instructor

Stefan Bilaniuk (pronounced Стефан Біланюк)
office: GCS 337
hours: Weekdays 11:00-11:50
or by appointment, or just drop by!
phone: 705 748-1011 x7474
home: 705 742-7862 [Do *not* call between 9 p.m. and 8 a.m. unless it's an emergency.]
e-mail: sbilaniuk@trentu.ca [If it's important, please call or see me in person.]
web: euclid.trentu.ca/math/sb/

Department of Mathematics

Colleen Berrigan
office: SC 327
hours: Weekdays 08:30-16:30
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, licensed under the Creative Commons Attribution-NonCommercial-ShareAlike License. May be downloaded for free from:

http://communitycalculus.org

Meetings

Lectures: Monday 14:00–15:50, Tuesday 16:00–16:50, and Friday 12:00-12:50, all in SC 137.
Please consult the Academic Timetable for the times and locations of the weekly seminars and workshops (one hour of each for everyone), as these might be added to and/or have their locations moved about.

Marking Scheme

There will be at least eleven assignments, a test, and a final examination. These will weigh as follows in the final mark:

Best 10 assignments (5% each)	50%
Test	15%
Final examination	35%

Please note that work worth at least 25% of the course should be completed, marked, and returned by the final date (Tuesday, 6 November) to withdraw from the course without academic penalty. Students who miss the test or more than one quiz for reasons beyond their control should contact the instructor as soon as possible to arrange to write a make-up. Assignments will not normally be accepted after the due date; students unable to hand in the assignments in time for reasons beyond their control should contact the instructor as soon as possible.

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 single-variable differential and some integral 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. Note also that a number of the assignments will involve using `Maple` or similar software to plot functions and solve calculus problems.

Weeks 0–2. *(6–21 September) Classes begin on Thursday, 6 September.* Chapters 1–2: Functions, limits, continuity, definition of the derivative. Assignment #1 due on Friday, 21 September.
Weeks 3–4. *(24 September – 5 October)* Chapters 3–4: Derivatives, curve sketching, Product, Quotient, and Chain Rules, trigonometric functions. Assignment #2 due on Friday, 28 September, and Assignment #3 due on Friday, 5 October.
Weeks 5–6. *(9–19 October) University closed on Monday, 8 October, for Thanksgiving Day.* Chapters 4–5: Exponential, logarithmic, and hyperbolic functions, curve sketching. Assignment #4 due on Friday, 12 October, and Assignment #5 due on Friday, 19 October.
Reading Week. *(22–26 October)* Enjoy!
Weeks 7–8. *(29 October – 9 November)* Chapter 6: applications of differentiation, optimization. Test written and Assignment #6 due on Friday, 2 November, and Assignment #7 due on Friday, 9 November. *The last day to withdraw from Fall courses is Tuesday, 6 November.*
Weeks 9–10. *(12–23 November)* Chapters 7–8: Integrals, the Fundamental Theorem of Calculus, techniques of integration. Assignment #8 due on Friday, 16 November, and Assignment #9 due on Friday, 23 November.
Weeks 11–12. *(26 November – 5 December)* Chapters 8–9: Techniques of integration, applications of integration. Assignment #10 due on Friday, 30 November, and Assignment #11 due on Wednesday, 5 December. *Wednesday, 5 December, is the last day of classes.*
Fall Examination Period. *(7–19 December)* 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 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) and one letter- or A4-sized aid sheet with whatever you want on all sides of 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.*

Web page

We will make only minimal use of Blackboard. A web page at `euclid.trentu.ca/math/sb/1110H/` will have hopefully-up-to-date information and all handouts, as well as material from a number of previous iterations of first-year calculus taught by the instructor.

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