Mathematics 1110H (Section A) – Calculus I: Limits, Derivatives, and Integrals
Trent University, Fall 2024

Instructor

Stefan Bilaniuk (pronounced Стефан Біланюк)

office: ENW 337

hours: Mondays 14:00-14:50, and Tuesdays through
Thursdays 11:00-11:50, all simultaneously on Zoom,
or by appointment, 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 09:00-16:00

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, 2024, licensed under the Creative Commons BY-NC-SA License. Download from: www.whitman.edu/mathematics/multivariable/

Meetings

Lectures: Mondays 17:00-18:50 and Wednesdays 08:00-08:50, all in SC 137.

Workshops: Weekly, starting in the week of Monday, 16 September. For times and locations, please consult your schedule.

Labs: Every other week, starting in the week of Monday, 9 September, for odd-numbered sections, and in the week of Monday, 16 September, for even-numbered sections. For times and locations, please consult your schedule.

Marking Scheme

There will be at least ten quizzes (actually 24-hour online mini-assigments), at least six fortnightly assignments, an in-person midterm test, and an in-person final exam, 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 (Tuesday, 5 November) 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

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.

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 likely require use of `Sagemath` or similar software.

Weeks 0-1. *(5-13 September)* Chapters 1–2: Functions, limits, continuity. Quiz #1 on Wednesday, 11 September. *Classes begin on Thursday, 5 September. The first class in MATH 1110H is on Monday, 9 September.*

Weeks 2-3. *(16-27 September)* Chapters 2–3: Limit definition of the derivative, properties of derivatives, some derivatives of commmon functions. Quiz #2 on Wednesday, 18 September; Assignment #1 due on Friday, 20 September; Quiz #3 on Wednesday, 25 September.

Weeks 4-5. *(30 September – 11 October)* Chapters 3–4: Product, Quotient, and Chain Rules for derivatives, trigonometric functions. Quiz #4 on Wednesday, 2 October; Assignment #2 due on Friday, 4 October; Quiz #5 on Wednesday, 9 October.

Weeks 6-7. *(14-18 October & 28 October – 1 November)* Chapters 4–5: Exponential, logarithmic, and hyperbolic functions, curve sketching. Quiz #6 on Wednesday, 16 October; Assignment #3 due on Friday, 18 October; Test in class (tentatively) on Wednesday, 30 October. *University closed on Monday, 14 October: Thanksgiving Day. Reading Week is 21-25 October. No class!*

Weeks 8-9. *(4-15 November)* Chapter 6: applications of differentiation, optimization. Quiz #7 on Wednesday, 6 November; Assignment #4 due on Friday, 8 November; Quiz #8 on Wednesday, 13 November. *The last date to drop this course without academic penalty is Tuesday, 5 November.*

Weeks 10-12. *(18 November – 4 December)* Chapters 7–8: Integrals, the Fundamental Theorem of Calculus, techniques of integration, applications of integration. Quiz #9 on Wednesday, 20 November; Assignment #5 due on Friday, 22 November; Quiz #10 on Wednesday, 27 November; Assignment #6 due on Wednesday, 4 December. *Wednesday, 4 December, is the last day of classes.*

Examination Period. *(6-19 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 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 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/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 2024-08-27.

MATH-1110H-A: Calculus I: Limits, Derivatives, and Integrals 2024FA - Peterborough Campus

Instructor:

Instructor: Stefan Bilaniuk

Email Address: sbilaniuk@trentu.ca

Phone Number: 705-748-1011 x7474

Office: ENW 337

Office Hours: Mondays 14:00-14:50 and Tuesdays through Thursdays 11:00-11:50, all simultaneously in-person and on Zoom.

Meeting Times:

Lectures: Mondays 17:00-18:50 and Wednesdays 08:00-08:50, all in SC 137.

Workshops & Labs: Starting in the week of Monday, 9 September. For times and locations, please consult your schedule.

Please refer to the academic timetable on myTrent for up-to-date scheduling information, as these times and locations may change.

Department:

Academic Administrative Assistant: Colleen Berrigan

Email Address: math@trentu.ca

Phone Number: 7715

Office: SC327

Description:

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.

Learning Outcomes:

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).

Texts:

Single Variable Calculus (Early Transcendentals), by David Guichard, 2024, licensed under the Creative Commons BY-NC-SA License. You may download it from https://www.whitman.edu/mathematics/multivariable/ or locally from the course site on Blackboard.

There will also be a few handouts extending the content of the textbook.

Readings:

Please see the schedule for a rough guide to the planned progress through the textbook and the material.

Assessments, Assignments and Tests:

There will be at least ten quizzes (actually 24-hour online mini-assignments), at least six fortnightly assignments (also online), an in-person midterm test, and an in-person final exam.

Grading:

The quizzes, assignments, test, and final examination will weigh 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%

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.

Grade Total by Withdrawal Date:

Please note that work worth at least 25% of the course should be completed, marked, and returned by the final date (Tuesday, 5 November) to withdraw from the course.

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 likely require use of Sagemath or similar software.

Weeks 0-1. (5-13 September) Chapters 1–2: Functions, limits, continuity. Quiz #1 on Wednesday, 13 September. *Classes begin on Thursday, 5 September. The first class in MATH 1110H is on Monday, 9 September.*
Weeks 2-3. (16-27 September) Chapters 2–3: Limit definition of the derivative, properties of derivatives, some derivatives of common functions. Quiz #2 on Wednesday, 18 September; Assignment #1 due on Friday, 20 September; Quiz #3 on Wednesday, 25 September.
Weeks 4-5. (30 September – 11 October) Chapters 3–4: Product, Quotient, and Chain Rules for derivatives, trigonometric functions. Quiz #4 on Wednesday, 2 October; Assignment #2 due on Friday, 4 October; Quiz #5 on Wednesday, 9 October.
Weeks 6-7. (14-18 October & 28 October – 1 November) Chapters 4–5: Exponential, logarithmic, and hyperbolic functions, curve sketching. Quiz #6 on Wednesday, 16 October; Assignment #3 due on Friday, 18 October; Test in class (tentatively) on Wednesday, 30 October. *University closed on Monday, 14 October: Thanksgiving Day. Reading Week is 21-25 October. No class!*
Weeks 8-9. (4-15 November) Chapter 6: applications of differentiation, optimization. Quiz #7 on Wednesday, 6 November; Assignment #4 due on Friday, 8 November; Quiz #8 on Wednesday, 13 November. *The last date to withdraw from this course is Tuesday, 5 November.*

Weeks 10-12. (18 November – 4 December) Chapters 7–8: Integrals, the Fundamental Theorem of Calculus, techniques of integration, applications of integration. Quiz #9 on Wednesday, 20 November; Assignment #5 due on Friday, 22 November; Quiz #10 on Wednesday, 27 November; Assignment #6 due on Wednesday, 4 December. *Wednesday, 4 December, is the last day of classes.*

Examination Period. (6-19 December) Exam schedule to be determined.

Course Guidelines:

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 with other devices or networks) 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.

University Policies:

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 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.

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.

Sharing and Distribution of Course Content

Students in this class should be aware that classroom activities (lecture, seminars, labs, etc.) may be recorded for teaching and learning purposes. Any students with concerns about being recorded in a classroom context should speak with their professor. If a student shares or distributes course content in any way that breaches copyright legislation, privacy legislation, and/or this policy, the student will be subject to disciplinary actions under the relevant Academic Integrity Policy, the Charter of Student Rights & Responsibilities, or the Policy on the Protection of

Personal Information, at a minimum, and may be subject to legal consequences that are outside of the responsibility of the university.

Student Absenteeism, Missed Tests and Examinations

Students are responsible for completing all course requirements, including attending classes and meeting assignment deadlines as specified on their syllabus.

Adjustments and deferrals to dates for participation, assignment submissions, tests, midterms and final examinations are not automatic. It is the student's responsibility to email their instructor immediately if they are unable to fulfill academic requirements.

Courses delivered remotely may involve student participation in scheduled (synchronous) classes via web-based platforms, such as Zoom. Students unable to participate (i.e., by video and/or audio) should email their instructors to request alternative arrangements for participation in these scheduled (synchronous) classes.

Students are required to be available for all tests, midterms and exams that are listed in their course syllabus and scheduled by their instructor or the Office of the Registrar. Depending on their program, the instructor or the chair/director may decide on alternative arrangements for exams and tests. Normally a doctor's note or supporting documentation is not required; however, when a student's success in the course or program is in jeopardy as determined by the instructor or chair/director, documentation may be requested.

Specific SAS accommodations can be implemented for students registered with Student Accessibility Services (SAS), but it is the responsibility of the student to make these arrangements in advance as per SAS guidelines, and to discuss accommodations of due dates with their instructors.

Students can notify the Office of the Registrar of their wish to observe cultural or religious holidays during scheduled examination periods by the deadline set in the Academic Calendar. Personal travel plans are not acceptable reasons for missing tests or exams.

Print