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Mathematics 1120H – Calculus II: Integrals and Series

Trent University, Winter 2022 *[Last modified 2022-01-04.]*

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Instructor

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Department of Mathematics

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Prerequisite: MATH 1110H – Calculus I: Limits, Derivatives, and Integrals

Text

> *Single Variable Calculus* (Early Transcendentals), by David Guichard.

Licensed under the Creative Commons Attribution-NonCommercial-ShareAlike License. Download it for free from: http://communitycalculus.org   (There will also be a local copy on Blackboard.)

Meetings

Lectures: Tuesdays 09:00-10:50 and Fridays 15:00-15:50, all in ENW 114.
Labs and Seminars: The class is divided into five smaller groups for the weekly labs and seminars. Please consult the Academic Timetable at https://www.trentu.ca/registrar/academic-timetable for the times and locations of your lab and seminar.

Marking Scheme

There will be at least eleven weekly assignments (due Fridays) and a final examination. These will weigh as follows in the final mark:

Best 10 assignments (6.5% each)	65%
Final examination	35%

Please note that work worth at least 25% of the course should be marked and returned by the final date (Friday, 11 March) to withdraw from the course without academic penalty. Students unable to complete quizzes or assignments in time should contact the instructor as soon as possible.

This scheme may be modified for individual students in *exceptional* circumstances. Any such modification will require the agreement of both the student and the instructor.

Content & Learning Outcomes

MATH 1120H is an introduction to concepts and techniques of single-variable integral calculus and series, with some applications to other areas of mathematics and science. Upon successful completion of this course, a student should be able to:

1. Compute definite and indefinite integrals of many functions using various substitutions, integration by parts, and/or partial fractions.
2. Identify and evaluate improper integrals.
3. Use integrals to compute the arc-length of curves, the areas of surfaces of revolution, and centres of mass of various objects.
4. Compute limits of sequences, using both direct (*e.g.* algebraic) and indirect (*e.g.* squeeze-play) methods.
5. Use various tests to determine whether a given series converges or not, and be able to compute the sum of some (*e.g.* geometric series).
6. Use various tests to determine the radius and interval of convergence of a power series.
7. Use Taylor's formula to find the Taylor series of a function at a point, and be able to use a remainder term to estimate how close a Taylor polynomial is to the original function.

8. Have sufficient abstract conceptual understanding of continuity, derivatives, integrals, and antiderivatives to understand the main ideas in the proofs of some of the results and techniques used in the course (*e.g.* the Comparison and Ratio Tests), and the statements of various others well enough to use them (*e.g.* term-by-term differentiation and integration of Taylor series inside the radius of convergence).

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 addition, many assignments may involve using `SageMath` or similar software.

Weeks 1 & 2. *(10-21 January)* Chapters 7 & 8: Definite and indefinite integrals, properties of integrals, techniques of integration. Assignment # 1 due on Friday, 21 January.

Weeks 3 & 4. *(24 January – 4 February)* Chapter 8: More techniques of integration, improper integrals (§9.7). Assignment #2 due on Friday, 28 January, and Assignment #3 due on Friday, 4 February.

Weeks 5 & 6. *(7-18 February)* Chapter 9: Applications of integration to areas, volumes, and centers of mass. Assignment #4 due on Friday, 11 February, and Assignment #5 due on Friday, 18 February.

Reading Week. (21-25 February) Enjoy! *University closed for Family Day on Monday, 21 February.*

Weeks 7 & 8. *(28 February – 11 March)* Chapters 9 & 11: Applications of integration to arc lengths and surface areas. Sequences and series, convergence tests. Assignment #6 due on Friday, 4 March, and Assignment #7 due on Friday, 11 March. *The last date to withdraw from this course is Friday, 11 March.*

Weeks 9 & 10. *(14-25 March)* Chapter 11: More convergence tests, power series. Assignment #8 due on Friday, 18 March, and Assignment #9 due on Friday, 25 March.

Weeks 11 & 12. *(28 March – 8 April)* Chapter 11: Calculus with power series, Taylor series. Assignment #10 due on Friday, 1 April, and Assignment #11 due on Friday, 8 April. *Classes end on Friday, 8 April.*

Examination period. *(11-27 April)* The final exam will written at a time and location to be determined. *University closed for Good Friday on Friday, 15 April*

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 1120H:

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 final exam, you are permitted to use your textbook and all other course material, but you may not use any other sources or aids, nor give or receive any help**, except to ask the instructor to clarify questions and to use a calculator (any that you like), unless you have 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 documentation from a regulated health care practitioner and feels that he/she 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.

Stefan's Calculus Archive Page

... is at `http://euclid.trentu.ca/math/sb/calculus/` and has links to quizzes, assignments, tests, and exams, many with solutions, from past iterations of MATH 1120H and other first-year calculus courses.