Department of Mathematics & Statistics
Concordia University

MAST 217
Introduction to Mathematical Thinking
Fall 2023

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Class Schedule: Tuesdays & Thursdays, 1:15 pm - 2:30 pm.

Office Hours: Tuesdays, 2:30 pm - 4:00 pm, or by appointment.

Course Objectives: This course is meant primarily for students who intend to pursue some concentration in mathematics or statistics at the university level.

The course aims to introduce students to some of the "tools of the trade" of the mathematician. Many courses present results of mathematicians' work; what we call "mathematical results." In this course, we will focus on *how* mathematicians arrive at these results. We will consider processes such as exploring, defining, conjecturing, solving, and proving. With an emphasis on mathematical proof, the course also aims to lay a foundation to assist students in all other university-level mathematics courses.

List of Topics: Some of the ideas that we will discuss include: the logical structure and language of mathematical statements, the difference between mathematical and everyday styles of argumentation, what mathematical proofs are, the roles of definitions, assumptions, examples and counterexamples in mathematical proofs, different mathematical proof methods, and problem-solving techniques.

To illustrate these ideas, we will consider some mathematics that is based on content that should be familiar to you (such as elementary notions about the real number system, geometry, and functions), as well as some mathematics that you may not be familiar with (such as the notion of cardinality).

Grading:

The following grading scheme will be used:

- Assignments: 30%
- Three In-Class Quizzes: 30%
- Final Examination: 40%

(Note: There is no "100% final option" in this course. It is absolutely necessary to do the assignments and quizzes).

If the grading scheme for this course includes graded assignments, a reasonable and representative subset of each assignment may be graded. Students will not be told in advance which subset of the assigned problems will be marked and should therefore attempt all assigned problems.

Text:

Primary source:
Mathematical Reasoning: Writing and Proof, Version 3, by T. Sundstrom
This textbook is open source (you can access it and download it for free online at the following link: https://www.tedsundstrom.com/mathematical-reasoning-3).

We may use other references to seek inspiration or instruction along the way, such as the following (not necessary to purchase):

- *Introduction to Mathematical Thinking: MAST 217 Notes prepared by Drs. J. Hillel, W.P. Byers, A. Sierpinska, & H. Proppe*
- *Mathematical Proofs: A Transition to Advanced Mathematics*, by G. Chartrand, A.D. Polimeni, & P. Zheng
- *An Introduction to Proof via Inquiry-Based Learning*, by D.C. Ernst
- *Book of Proof*, by R. Hammack
- *Passage to Abstract Mathematics*, by M.E. Watkins, & J.L. Meyer
- *Mathematical Thinking: Problem Solving and Proofs*, by J.P. D'Angelo, & D.B. West
- *Doing Mathematics: An Introduction to Proofs and Problem Solving*, by S. Galovich
- *How to Read and Do Proofs*, by D. Solow

Academic Integrity and the Academic Code of Conduct
This course is governed by Concordia University's policies on Academic Integrity and the Academic Code of Conduct as set forth in the Undergraduate Calendar and the Graduate Calendar. Students are expected to familiarize themselves with these policies and conduct themselves accordingly. "Concordia University has several resources available to students to better understand and uphold academic integrity. Concordia's website on academic integrity can be found at the following address, which also includes links to each Faculty and the School of Graduate Studies: https://www.concordia.ca/conduct/academic-integrity.html" *[Undergraduate Calendar, Sec 17.10.2]*

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