**Department of Mathematics & Statistics**
**Concordia University**

# MAST 217
Introduction to Mathematical Thinking
***Fall 2017***

**Course Instructor:** Dr. E. Cohen, Office LB 921-1 (SGW), Phone: (514) 848-2424, Ext. 3219
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**Course Objectives:** This course is meant primarily for students who intend to pursue some concentration in mathematics or statistics at the university level. However, students from outside mathematics who wish to take MAST 217 as an elective course have traditionally been very welcome in the course.

University-level mathematics courses tend to be somewhat theoretical, and they require the use of a particular language and style that is not familiar to many students. In our experience, students often find it difficult to know what the "rules of the game" are: Why all these proofs? What is one expected to know about proofs? What should be the balance between knowing how to do things and knowing why something is true?

MAST 217 *Introduction to Mathematical Thinking* aims to address the above questions and thus familiarize you with some of the "tools of the trade" of the mathematician. You will find this knowledge and proving skills useful in all of the mathematics courses you will take at university. The course is also an opportunity for you to broaden your horizons on what mathematics is and what mathematicians do.

The topics that we will be discussing include: how proofs work, different styles of proof, the difference between mathematical and everyday language and logic, the roles of examples and counter-examples, the transition from the finite to the infinite, and different techniques of problem solving. The course is not designed to teach a lot of new mathematical content (although there will be new material in the course that students will be responsible for). Most of the mathematics that will be used to illustrate the above topics will be based on familiar material regarding the real number system, geometry, and functions, and it will be re-discussed in class to the extent that it is needed.

**Text:** The text is a set of MAST 217 lecture notes, written by J. Hillel and W. Byers which can be purchased at the Book Store.

Other useful texts which can be used as references include:

- D'Angelo, J.P. and West, D.B., *"Mathematical Thinking, Problem Solving and Proofs"*, Prentice Hall.
- Eisenberg, M., *"The Mathematical Method, A Transition to Advanced Mathematics"*, Prentice-Hall.
- Galovich, S., *"Doing Mathematics; An Introduction to Proofs and Problem Solving"*, Harcourt Brace Jovanovich (1993).
- Gilbert, W.J. & Vanstone, S.A., *"An Introduction to Mathematical Thinking"*, PEARSON/Prentice Hall. (2005)
- Solow, D., *"How to read and do proofs. An introduction to mathematical thought processes"*, Wiley & Sons.

**Grading:** The following grading scheme will be used:
10 homework assignments: 20%
One class test in approximately the 7th week of classes: 20%
Final examination: 60%

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.

**List of topics:**
Introduction to Proofs
The Real Number System
Direct Proofs, Forward-Backward method
CCCC (Contra-positive, Converse, Contradiction, counter-example)
Proofs by Mathematical Induction
Quantifiers
Sets, Cardinality, Countable and Uncountable sets
Problem Solving and Heuristics

**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: concordia.ca/students/academic-integrity." *[Undergraduate Calendar, Sec 17.10.2]*