

Syllabus

Section X1: MWF 12:00 – 12:50 p.m., Altgeld 145

Text: D'Angelo/West, Mathematical Thinking, Second Edition.

Office hours: Wednesday 3:00 – 4:00 p.m. (258/269 CAB). Office: 243 CAB. Email: lmattos@illinois.edu

Prerequisites: MATH 231 (Calculus II). In general, we do not assume prior study, but mathematical maturity.

Resources: Electronic mail is a medium for announcements and questions. The course webpage also can help.

Exams: there are three midterms (evening 90 min exams, 100 points each) plus a final exam (200 points). The dates for the midterms are **February 17th, March 24th and April 21st**.

Final exam: 1:30 – 4:30 p.m., Friday, May 5.

Homework: weekly problem sets (5 to 10 problems). All of them will have the same weight at the end. The due dates will be normally Wednesdays before class. The 8 highest homework grades out of 9 count.

Homework Expectations: all assignments being turned in must be clear, legible and well-organized. All work must be shown and well-explained; a final answer without supporting work and explanation may be worth nothing. All assignments must be turned in order. Failure to abide by the homework expectations may result in the homework not being accepted or only receiving partial credit. If two homework have identical solutions to a problem, both works are discarded.

Typing Homework: For each homework, additional 2 points will be added for typing it (no need to type pictures).

Requirements: homework has 160 points (plus up to 16 points in total for typing the assignments), tests 300 points, final exam 200 points and participation in class activities up to 20 points. The total maximum is 696 points. The homework provides practice finding proofs and writing proofs; writing up the solutions is among the most effective ways of keeping up with the material in the course. The threshold for A+ is 620 points, for A is 590 points, for A- is 560 points, for B+ is 510 points, for B is 460 points, for B- is 410 points, for C+ is 360 points, for C is 310 points, for C- is 260 points, for D- is 160 points.

LIST OF TOPICS:

Chapter 1. Numbers, Sets, and Functions

- Set-theoretic concepts and operations
- Functions: formal definition and basic concepts (graph, image set, bounded function, decreasing/increasing function)
- Triangle and AGM inequalities

Chapter 2. Language and Proof

- Logical statements, conditionals, quantifiers
- Methods of proof

Chapter 3. Induction

- Sum/product notations
- Induction and strong induction
- Well-ordering principle
- Applications

Chapter 4. Bijections and Cardinality

- More about functions: injective, surjective, bijective properties, compositions and inverses
- Cardinality, finite, countable, and uncountable sets
- Countability of rationals

Chapters 13 and 14. Real Numbers, Sequences and Series

- Infinite sequences and series: formal definition of convergence, basic properties of convergent sequences and series
- Sup, inf, and the Completeness Axiom
- Cauchy sequences and the Cauchy Convergence Criterion
- Montone Convergence Theorem
- Bolzano-Weierstrass Theorem

Additional Topics. - Possible choices: Number Theory (Chapters 6 and 7), Combinatorics (Chapter 5, 10 - 12), and Probability (Chapter 9).