

Hunter College of The City University of New York

Department of Mathematics & Statistics

Academic Year 2023-2024

MATH 15600: Introduction to Mathematical Proof Workshop, 2 hrs., 1 cr. Prerequisite: MATH 15000 (Calculus) ; Prerequisite or Corequisite: MATH 15500. Can be taught In-Person or Fully Online.

Textbook: **Book of Proof**, Third Edition, by Richard Hammack © 2018, Richard Hammack (publisher). ISBN 978-0-9894721-2-8, (368 pages). Download the *ebook* for *free* from our Blackboard course web site (Course Materials folder); you can purchase a print edition on Amazon or Barnes & Noble for around \$22.

Note: Materials on **Limit Proofs** do not follow the textbook; instead, Professor Cherkas has Power Point Notes that cover limit proofs in a more thorough fashion, using general principles for polynomial and rational functions.

Online Materials: (to request access, send email to: barry.cherkas@hunter.cuny.edu)

On Professor Cherkas Blackboard course website, there are weekly lists of learning outcomes, learning materials, and learning activities. Learning materials include weekly power point slides, videos, and reading assignments; the learning activities include sample weekly workshops (homework assignments) and, in terms of limit proofs, supplementary videos and self-diagnostic quizzes. The workshops should be revised to create individualized workshops.

Grading: Two midterms, a final and weekly workshops. Recommended percentages: 40% workshops, 20% each exam.

Course Learning Outcomes:

- Construct direct, contrapositive, indirect (contradiction), and induction proofs, as well as counterexamples, and determine the appropriateness of each method in a particular setting;
- Learn to start proofs with the proof method, definitions of any given terms, and continue to construct proofs that are not only mathematically correct but also clearly written, *convincing*, readable, notationally consistent, and grammatically correct;
- Verify relations and functions, including surjections, injections, inverses, and bijections, equivalence relations, and equivalence classes;
- Learn to formulate and write your own limit definitions and proofs for convergence and divergence of sequences and series, and learn how to develop conjectures;

- Formulate limit definitions and proofs involving limits at a point for polynomials, rational functions, as well as cases of transcendental functions that do not have a limit at a point, in both English words and mathematical symbols using logical connectives.

Sample Weekly Schedule:

A sample weekly schedule (the one used by Prof. Cherkas) follows. Depending on how deeply the material is covered, this may be overly ambitious. The goal of this course is to introduce enough logic (in the first 5 lecture weeks) to cover fully and completely (in the next 5 lecture weeks) the topics in limit proofs. Instructors need to gauge the extent that they might want to exclude less relevant topics, such as the week #13 material, to cover all the limit proof topics.

Week	Topics, Videos; Reading Assignments	Chapters/PowerPoint Notes	Weekly Activities
#1	Counterexamples; Sets Week #1 PowerPoints	Chapter §1.1-§1.8: Sets	Diagnostic Test; Week #1 Workshop
#2	Week #2 PowerPoints	Chapter §2.1-§2.11: Logic	Week #2 Workshop
#3	Week #3 PowerPoints	Chapters §4.1-§4.5 & §10: Direct Proof; Mathematical Induction (Triangle Inequality)	Week #3 Workshop
#4	Week #4 PowerPoints	Chapters §5.1-§5.2 & §6.1-§6.2: Contrapositive Proof and Proof by Contradiction	Week #4 Workshop
#5	Week #5 PowerPoints	Chapters §7.1 & §8; Biconditional Statements; Existence & Uniqueness	Week #5 Workshop
#6	MIDTERM EXAM #1	Midterm Exam 1 (covers material & workshops from weeks #1-#5)	Study Solutions to Workshops
#7	Week #7 PowerPoints	Convergence and Divergence of Sequences	Week #7 Workshop
#8	Week #8 PowerPoints	Convergence and Divergence of Infinite Series and Infinite Products	Week #8 Workshop
#9	Week #9 PowerPoints	Limits of Functions; Especially Polynomial Functions	Week #9 Workshop
#10	Week #10 PowerPoints	Limits of Rational Functions	Week #10 Workshop
#11	Week #11 PowerPoints	When a Limit Does Not Exist	Week #11 Workshop
#11	MIDTERM EXAM #2	Midterm Exam 2 (covers material & workshops from weeks, #6-10)	Study Solutions to Workshops
#13	Week #13 PowerPoints	Chapters §11 & §12: Relations and Functions	Week #13 Workshop
#14			
#15	FINAL EXAM		

The Following information is required by Hunter College on all course syllabi.

1. Academic Integrity Statement: “Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures.”

2. ADA Statement: “In compliance with the ADA and with Section 504 of the Rehabilitation Act, Hunter College is committed to ensuring educational access and accommodations for all its registered students. Hunter College’s students with disabilities and medical conditions are encouraged to register with the Office of AccessABILITY for assistance and accommodation. For information and appointment contact the Office of AccessABILITY located in Room E1214 or call (212) 772-4857 /or VRS (646) 755-3129.”

3. Hunter College Policy on Sexual Misconduct: “In compliance with the CUNY Policy on Sexual Misconduct, Hunter College reaffirms the prohibition of any sexual misconduct, which includes sexual violence, sexual harassment, and gender-based harassment retaliation against students, employees, or visitors, as well as certain intimate relationships. Students who have experienced any form of sexual violence on or off campus (including CUNY-sponsored trips and events) are entitled to the rights outlined in the Bill of Rights for Hunter College.
 - a. **Sexual Violence**: Students are strongly encouraged to immediately report the incident by calling 911, contacting NYPD Special Victims Division Hotline (646-610-7272) or their local police precinct, or contacting the College's Public Safety Office (212-772-4444).
 - b. **All Other Forms of Sexual Misconduct**: Students are also encouraged to contact the College's Title IX Campus Coordinator, Dean John Rose (jtrose@hunter.cuny.edu or 212-650-3262) or Colleen Barry (colleen.barry@hunter.cuny.edu or 212-772-4534) and seek complimentary services through the Counseling and Wellness Services Office, Hunter East 1123.

CUNY Policy on Sexual Misconduct Link:

<http://www.cuny.edu/about/administration/offices/la/Policy-on-Sexual-Misconduct-12-1-14-with-links.pdf>”