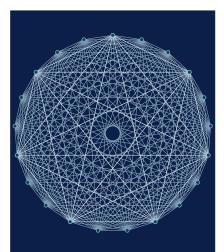
TRANSITION TO ADVANCED MATHEMATICS

MATH 265-01 MWF 12:00 - 12:50 PM HIRT 209

INSTRUCTOR

Dr. Lauren Williams Old Main 404 lwilliams@mercyhurst.edu (814) 824-2226



OFFICE HOURS

- Monday 9:00 10:00 Tuesday 12:30 - 1:30 Wednesday 1:00 - 3:00
- Thursday 8:00 9:00

Friday 1:00 - 2:00

and by appointment

COURSE DESCRIPTION

This course is designed to facilitate the mathematics student's transition to courses requiring a higher level of mathematical maturity. Emphasis will be on the reading and writing of proofs, and on communicating mathematics both orally and in writing. Topics will include logic, set theory, functions, relations, and number theory.

FALL 2018

COURSE OBJECTIVES

In this course, you will:

- learn to write using formal, mathematical language with correct notation;
- learn to construct direct proofs, proof by contradiction, and proofs by induction;
- learn to read mathematics critically, and be able to determine whether a proof is sound or flawed;
- define relations between sets of objects and the properties of those relations;
- learn the basic definitions and principles of logic, set theory, combinatorics, and number theory;
- be exposed to several different areas of mathematics, via direct study or within examples designed to clarify other topics;
- learn to apply new techniques of problem solving to challenging material, both in this course and in future study.

Prerequisites

This course is intended for students pursuing a major or minor in mathematics. Calculus I and Linear Algebra, or instructor permission, are required.

 $Course \ Website: \ http://math.mercyhurst.edu/\sim lwilliams/Math 265/index.php$

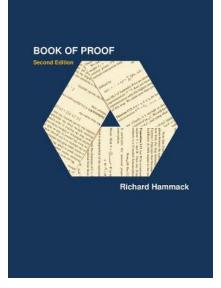
Техтвоок

Book of Proof, 2nd Edition, by Richard Hammack ISBN-10: 978-0-9894721-0-4

The textbook is available as a free PDF from the author's website: https://www.people.vcu.edu/~rhammack/BookOfProof/ Additional sources may be suggested during class, but will not be required.

You will not be expected to bring the text to class, so the electronic version is all you'll need. However, inexpensive (\sim \$15) paperback copies are available through the website above if you would prefer a hard copy.

You are strongly encouraged to read ahead in the text, and work on the practice problems at the end of each section after we've covered the topic in class. Solutions to many problems are at the end of the textbook. Your work on these problems will not be collected, but the questions may appear on exams.



Additional Resources

There are several free textbooks and websites that you may find useful and inspiring while taking this course:

• The American Institute of Mathematics maintains a list of reviewed, open source textbooks, several of which focus on an introduction to proofs. There are also texts on prerequisite subjects, including calculus, linear algebra, and more.

https://aimath.org/textbooks/approved-textbooks/

- CoCalc is a cloud based, online computing environment that allows you to write programs in SageMath, GAP, Maxima, R, Python, Julia, and many more. You can also learn and practice typesetting in IATEX, highly recommended for all mathematics students. https://cocalc.com/
- Cut the Knot features an enormous collection of interesting mathematics problems, puzzles, proofs, and games.

https://www.cut-the-knot.org/front.shtml

OTHER COURSE INFORMATION

- Be warned you will struggle in this class! The material here is unlike anything you've seen before, and is not at all like a traditional math course. You'll be learning a new language along with some new abstract mathematics. Be prepared to spend plenty of time on the homework and reading.
- Please ask questions in class or office hours whenever you're stuck, but make an effort to find a solution or proof before seeking help. The process is more important than the result in this course, and the only way to become comfortable is to work through it on your own.
- I will attempt to answer email as quickly as possible, but please allow up to 24 hours for a response (particularly on weekends).
- Attendance is not required, but coming to class regularly will generally improve your grade. You are responsible for any work material covered in your absence. Please contact me if you are absent for an extended period.

COURSE COMPONENTS

Homework

There will be 10 homework assignments throughout the semester, typically due one week after they are assigned. Some problems will be marked "suggested" and will not be collected. These will usually be problems from the textbook; solutions to many of these problems are available on the website for the textbook. These problems may appear on exams, so you are strongly recommended to work through them.

For collected problems, you are expected to submit your final work. Problems involving calculations should include work and an explanation of the steps used to arrive at your answer. Proofs should use formal language and notation, as covered in class. Work should be clear and neatly written.

You should expect to spend a fair amount of time on each assignment - don't wait until the night before it's due to get started! You are free to work together on your assignments, but everyone must submit their own work, in their own words. Late homework will be accepted with a 2 point per day penalty, until the graded assignment is returned to class.

If you are unable to submit your work in class, you can email a clear scan or photo of your work.

Exams

We will have two midterm exams and a final exam. The final exam will be cumulative, while the midterm exams will focus on more recent material. Both exams will be based on homework problems and the suggested textbook problems that do not need to be turned in.

You will be able to make up exams for excused absences. If you know in advance that you will not be able to take an exam at its schedule time, please let me know as soon as possible. All make ups must be completed within one week of the exam date. You are required to take the final exam for this course regardless of your average on earlier exams or homework.

The final exam is scheduled for Thursday, December 13, 10:30 am - 12:30 pm.

Progress

Homework and exam grades will be posted on Blackboard throughout the semester.

LEARNING DIFFERENCES

In keeping with college policy, any student with a disability who needs academic accommodations must call Learning Differences Program secretary at 824-3017, to arrange a confidential appointment with the director of the Learning Differences Program during the first week of classes.

GRADING

160 points	Midterm Exams Two exams, 80 points each						
240 points	Homework Ten assignments, 24 points each						
100 points	Fina	l Exam	L				
500 POINTS Total Possible							
GRADING SCALE							
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300 330	350	380	400	430	450		
60% $67%$	70%	77%	80%	87%	90%		

COURSE SCHEDULE

24 Intro to Sets, Cartesian Product 27 Subsets, Power Sets 29 Set Operations, Venn Diagrams 31 Indexed Sets, Number Systems Sep 3 No Class - Labor Day 5 Statements, And, Or, Not 7 7 Conditional and Biconditional Statements HW 1 Due 10 Truth Tables, Logical Equivalence 12 12 Quantifiers HW 2 Due 14 Symbolic Logic HW 2 Due 17 Negation HW 3 Due 24 Theorems and Definitions E 26 Direct Proof HW 4 Due Oct 1 Catch Up / Make Up Day Exam I 5 No Class - Fall Break Image: Set	Aug	22	Class Introduction	
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7 Outro		7		
13 Final Exam 10:30 am		13	Final Exam 10:30 am	

OTHER Important Dates

August 27 Add/Drop Deadline

> October 23 Advising Day

November 16 Withdrawal Deadline

> November 23 Fibonacci Day

December 10 Reading Day

Use this schedule to check which topics are coming up in class, so you can read ahead in the textbook.

We will attempt to adhere to this schedule as closely as possible. Topics may be covered on other dates, but exams will be held as scheduled.

All changes to the course schedule, including due dates for homework assignments, will be announced in class.