Spring 2-1-2022

M 307.01: Introduction to Abstract Mathematics

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M 307 – Introduction to Abstract Mathematics, Spring 2022

Contact information

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- Office hours: Wednesday 1:30-3 PM

Course description

Designed to prepare students for upper-division proof-based mathematics courses. Topics include proof techniques, logic, sets, relations, functions and axiomatic methods.

This course will use an "inquiry-based learning" approach. This means that classes will not be lecture-oriented. Instead, to quote Dr. Dana Ernst,

> *You will be expected to work actively to construct your own understanding of the topics at hand with the readily available help of me and your classmates. Many of the concepts you learn and problems you work on will be new to you and ask you to stretch your thinking. You will experience frustration and failure before you experience understanding. This is part of the normal learning process. If you are doing things well, you should be confused at different points in the semester.*

Learning outcomes

1. Recognize correct and incorrect mathematical reasoning.
2. Demonstrate an understanding of basic mathematical logic.
3. Use counterexamples in rigorous arguments.
4. Write clear and concise proofs using the following methods: direct proof, contrapositive proof, proof by contradiction and proof by mathematical induction.
5. Write clear and concise proofs using basic set theory.
6. Write clear and concise proofs using precise definitions for functions and relations.
7. Write clear and concise proofs using injections, surjections, and bijections to compare cardinalities of sets.

Textbook

There is no assigned textbook for this class. I will provide the class with lecture notes adapted from the open source textbook developed by Dr. Dana Ernst at Northern Arizona University.

Daily Homework

After each class meeting you will be assigned several problems to complete before the next class meeting. These problems will be the basis of the class meetings. Students will present their solutions and as a class we will work together to improve/polish the argument until everyone is convinced we

have a rigorous argument. Completing the daily problems will require reading the class notes. You are strongly encouraged to work together on the daily homework. Mathematics is a social activity!

Weekly homework

Weekly homework will be a subset of prior daily exercises that you are expected to type up beautifully. Late homework will only be given partial credit and may not be given feedback. As a courtesy for unforeseen circumstances one homework grade will be dropped. Homework missed due to illness, etc (with proper documentation) will also be dropped. Homework will be graded both on correctness and clearness of arguments. Work that is too difficult to read may be marked off. Homework will be submitted online on Moodle.

Written work

The weekly homework must be typeset in LaTeX. For those students who have not used LaTeX, I will provide links to a short tutorial and give a template file for preparing homework. I strongly recommend the free web-based LaTeX editor: https://www.overleaf.com/

Final exam

The final exam is scheduled for 10:10-12:10 AM, Monday, May 9. The University does not permit early final exams. Schedule your travel plans accordingly!

Grading

Your grade will be composed of: 40% daily homework/presentations, 40% weekly homework and 20% final exam. Letter grades and +/-s will be assigned according to the standard scale.

Class website

Homework assignments and assigned readings will be posted to Moodle. Check it regularly!

Accommodations

The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and the Office for Disability Equity (ODE). If you anticipate or experience barriers based on disability, please contact the ODE at: (406) 243-2243, ode@umontana.edu, or visit www.umt.edu/disability for more information. Retroactive accommodation requests will not be honored, so please, do not delay. As your instructor, I will work with you and the ODE to implement an effective accommodation, and you are welcome to contact me privately if you wish.

Academic honesty

All students must practice academic honesty. Academic misconduct is subject to an academic penalty by the course instructor and/or a disciplinary sanction by the University. All students need to be familiar with the Student Conduct Code. You can find it in the A to Z Index on the UM home page.

Registration deadlines

Full registration deadlines can be found online on the registrar calendar (http://www.umt.edu/registrar/calendar.php).

COVID-19

- Mask use is required within the classroom or laboratory.
- If you feel sick and/or are exhibiting COVID-19 symptoms, please don't come to class and contact the Curry Health Center at (406) 243-4330.
- If you are required to isolate or quarantine, you will receive support in the class to ensure continued academic progress.
- UM recommends students get the COVID-19 vaccine. Please direct your questions or concerns about vaccines to Curry Health Center.
- Where social distancing (maintaining consistent 6 feet between individuals) is not possible, specific seating arrangements will be used to support contact tracing efforts.
- Class attendance and seating will be recorded to support contact tracing efforts.
- Drinking liquids and eating food is discouraged within the classroom.