MAT 108 - Introduction to Abstract Math
Sections: B01 & B02

Class Time: MWF 1:10 - 2:00 pm, Young 184
Instructor: Dr. Stephanie Dodson, sadodson@ucdavis.edu
Office: Mathematical Sciences Building, Room 2145
Office Hours: Tuesdays and Fridays 11 AM - 12 PM
Course Website: Canvas

Graduate TA: Emily Meyer, emeyer@math.ucdavis.edu
TA Office Hours: Thursdays 1-3 PM
Recitation Sessions: B01: Tuesday 6:10 - 7:00 pm, Olson 105
B02: Tuesday 7:10 - 8:00 pm, Olson 101

Course Description
Proofs are a fundamental concept used in higher level mathematics but writing a clear, concise, and correct proof takes practice. The primary goal of Math 108 is to teach students the fundamentals of mathematical thinking and clear writing of mathematical arguments. This is a beginners exposure to the notion of proof, the language used by mathematicians, and an introduction to concepts in higher level mathematics. Learning to write proofs is a lot like learning a new language; we will learn new vocabulary and structures along the way. Mastery of this course enhances the ability to write well-organized scientific arguments and supports the development of clear analytical thinking. Most of the explanations and practice will use examples from basic set theory, combinatorics, and algebra. The topics learned in this course set the foundation for higher level mathematics courses.

Topics
Specific course topics include, but are not limited to:

- Propositional logic, quantifiers.
- Methods of proof: direct proof, proof by contradiction, proof by induction.
- Elementary set theory.
- Equivalence relations and equivalence classes.
- Functions: injections, surjections, bijections, inverse functions.
- Cardinality: finite sets, countable sets, uncountable sets.

Prerequisite: Completion of MAT 21B: Integral Calculus (or equivalent)

Class Time
I highly urge you to attend all classes. Class time will include lectures and short active-learning activities, and will give you the opportunity to see the material first hand. Math is best learned by doing! The active-learning activities, but will help you by enhancing conceptual understanding of the material.

Office Hours
The instructor and TA office hours are a great place to come ask questions about course materials, receive guidance on homework problems, and ask about math research!
Recitations
The recitation sessions are optional, but attendance is encouraged. Recitation sessions will be lead by the graduate TA and consist of additional examples of the material covered in class and time for questions. Unless given approval, please attend your assigned recitation session.

Homework
The 10 weekly homework assignments will allow you to practice the course concepts, and allow for the most direct and individualized feedback about how you are progressing as a learner.

- Assignments will be available online every Wednesday, and are due the following Wednesday at the beginning of class (1:10 PM).
- Late assignments will not be accepted without a legitimate excuse and prior approval.
- Students are encouraged to collaborate on homework assignments, but assignments must be written up separately and individually.
- Homework assignments must take the form of a single, stapled packed with your name and neatly written (or typed in LaTeX) solutions labeled with problem numbers. Solutions should show all work, not just the final answer. Assignments that do not meet these requirements will receive a 20% deduction.
- If you cannot attend class on the day an assignment is due, drop it off at my office that day prior to 12:30 PM.

Exams
Exams will not be given at any other times, except in classes of severe illness or family emergency. If a serious conflict arises, you need to contact me as soon as possible and documentation verifying the excuse will be required.

- Midterm: Friday, November 1, 1:10 - 2:00 PM (in-class)
- Final: Monday, December 9, 8-10 AM

No calculators or notes are permitted on exams.

Assessment

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<tbody>
<tr>
<td>Homework</td>
<td>35%</td>
</tr>
<tr>
<td>Midterm Exam</td>
<td>30%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>35%</td>
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</tbody>
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Course Materials
The required course textbook is:

  - Either 7th or 8th edition acceptable

The course textbook is there to help you and will provide additional examples not covered in class. Homework will be posted on the course webpage.
Accommodations for Students with Disabilities
Any student with a documented disability (e.g. physical, learning, psychiatric, vision, hearing, etc.) who needs to arrange reasonable accommodations must contact the Student Disability Center (SDC). Faculty are authorized to provide only the accommodations requested by the SDC. If you have any questions, please contact the SDC at (530) 752-3184 or sdc@ucdavis.edu. If you are given accommodations for exams, please let me know a minimum of 2 weeks before the midterm so that I have time to make appropriate arrangements.

Diversity and Inclusion Statement
I strive to create a learning environment that supports a diversity of thoughts, perspectives, experiences, and honors your identities. To help accomplish this:

• As a participant in class discussion and recitation sessions, you should strive to honor the diversity of your classmates and differing viewpoints the diversity contributes.
• If you have a name and/or set of pronouns that differ from those that appear in your official records, please let me know.
• Please come talk with me if you feel your performance in the course is being impacted by your experiences outside of class, including, but not limited to, religious holidays, family emergencies, jury duty, and long-term health problems.
• If something was said in class (by anyone) that made you feel uncomfortable, please talk to me about it.

Additional Course Policies and Expectations

• Please create a respectful learning space for your peers by arriving before the start of class and not using cell phones or computers during class time without prior approval.
• All announcements will be posted on the course webpage (Canvas). It is your responsibility to check the webpage periodically for assignments and notes.
• Emails to me will be answered within 24 hours on weekdays and 48 hours on weekends. Please be respectful of your TA and instructor by being courteous and professional in emails.
• All students are expected to comply with and uphold the principles described in the UC Davis Code of Academic Conduct.
• I am here to facilitate your learning; let me know if you have questions! I can always be reached by e-mail, and can schedule additional office hours.
## Course Outline
Subject to slight modification. Check Canvas page for updates.

<table>
<thead>
<tr>
<th>Lecture(s)</th>
<th>Section(s)</th>
<th>Topics</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 – 6</td>
<td>1.1 – 1.6</td>
<td>Introduction and course policies. Logic and proofs. Lighter on initial material with emphasis on proof techniques.</td>
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<tr>
<td>7 – 11</td>
<td>2.1 – 2.5</td>
<td>Sets and induction. Emphasis on mathematical induction and equivalent principles.</td>
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<tr>
<td>12 – 14</td>
<td>3.1 – 3.3</td>
<td>Equivalence relations and partitions.</td>
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<tr>
<td>15 – 19</td>
<td>4.1 – 4.4</td>
<td>Functions. Emphasis on onto and 1-1 functions.</td>
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<tr>
<td>20 – 23</td>
<td>5.1 – 5.3</td>
<td>Cardinality, Do in full detail up to Theorem 5.3.8, which requires the Axiom of Choice.</td>
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<td>24</td>
<td>5.4 – 5.5</td>
<td>Order of cardinals, comparability. Emphasis on section 5.4, but omit proof of Cantor-Schroeder-Bernstein Theorem and do 5.5 lightly.</td>
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<td>25 – 28</td>
<td>6.1 – 6.4</td>
<td>Groups, subgroups, and operation preserving maps.</td>
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<tr>
<td>29</td>
<td>6.5</td>
<td>Rings and fields.</td>
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<tr>
<td>30</td>
<td></td>
<td>Connection to vector spaces</td>
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