Math 251: Foundations  
Spring 2008  
Course Procedures

Professor: Josh Laison  
Collins 305, x6689, jlaison@willamette.edu

Office Hours:  
Monday 3:00-4:30  
Wednesday 3:00-4:30  
Thursday 10:00-11:30 AM, at the Bistro  
or anytime by appointment or by catching me in my office.

Class Meetings: Collins 201, 1:50-2:50 Monday, Wednesday, Friday
Textbook: Chapter Zero, 2nd edition, Carol Schumacher
Course Web Page: http://www.willamette.edu/~jlaison/foundations.html

Grading:

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
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<tbody>
<tr>
<td>Written problems (8)</td>
<td>25%</td>
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<tr>
<td>Individual problems (8)</td>
<td>25%</td>
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<tr>
<td>Quizzes (around 35)</td>
<td>25%</td>
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<tr>
<td>Class participation and presentations</td>
<td>20%</td>
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<tr>
<td>Math colloquium talks (2)</td>
<td>5%</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
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Course Goals:

- Learn to write mathematical proofs.
- Learn mathematical writing and typesetting.
- Learn to communicate mathematics verbally, in conversations and in formal presentations.
- Learn a core set of mathematical tools that appear in most pure mathematics.
- Have fun.

Topics Covered:
We will cover most of Chapters 0-6 of Schumacher, as time permits. We will spend the first few weeks of class on logic and proof techniques, and then use these techniques to prove theorems in set theory, graph theory, ordered set theory, real analysis, modern algebra, and number theory.
Ways in Which This Course Is Different From Calculus:

1. In calculus, you could solve a problem set of 10 problems in a couple hours. In foundations, 10 problems might take closer to 20 hours to solve, and you will have 2 weeks or more to work on them.

2. In calculus, most of the problems are very similar to others that have already been solved for you. In other words, the textbook and the professor produced the new ideas, and you absorbed them. In foundations, you produce new ideas yourself. It is somewhat less important to memorize facts, and much more important to learn to think creatively in math.

3. During a calculus class, you were mostly a passive learner. During a foundations class, you are mostly an active participant!

4. Foundations is much more fun than calculus.

The Textbook:
The text is probably different from other math texts you have seen. You will notice that most of the theorems in the textbook are not proven, and many of the examples are not worked out. Your job will be to go through and fill in the gaps— in fact, this activity will take up a substantial portion of our class time.

Homework:
There will be four types of homework in this course:

Reading: Since you will be spending a lot of class time working with classmates, it is very important that everyone has read and thought about the relevant sections of the textbook before class begins. This is the purpose of the frequent quizzes. You are not expected to understand everything in the reading perfectly, but you are expected to think about it in preparation for discussing it in class.

Written Problems: The written problems will be due every two weeks. You may work together on these problems; in fact, you may have the opportunity to work on them in class. However, please write your solutions to these problems in your own words. In addition, all of your solutions to these problems should be written in the \LaTeX word-processing application. We will talk more about this in class.

Part of the goal of this course is for you to learn to speak and write mathematics well. Therefore it is not enough to submit a written solution which includes the key ideas, or the final “answer.” The clarity and form of your solution are just as important, and will count for half of your grade.

Oral Problems: I will routinely ask members of the class to prepare solutions to problems to present in class. Sometimes the whole class will be asked to work on the same set of problems; sometimes they will be divided up by groups or by individual. You will probably find that, although giving an oral presentation on a problem seems easier than writing up the solution, you will have to think just as carefully about these problems
as you do about the written ones. In fact, it would probably help to write out your argument beforehand, so you have things straight in your mind.

**Individual Problems:** These are problems that I will ask you to complete by yourself, without help from other students. You may not consult any person about these problems other than me. You may not consult any source about these problems other than your textbook, your notes, and class handouts. No special word processing is necessary for these problems (you may write the solutions by hand if you wish) although writing style and clarity of presentation is still important. These problems take the place of exams in this course. Please treat them accordingly.

**Quizzes:**
Most days of class will start with a 5 minute quiz (most likely one short question). The quizzes will be designed to test whether you have done the reading for the day. If you are familiar with the definitions and basic ideas in the reading, the quizzes should be quick and painless.

**Attendance and Class Participation:**
Since in-class activities will be such a large component of the course, the portion of your grade for attendance and class participation is correspondingly high. The class will cease to function if many people are absent or disengaged. Please support your classmates by coming to class every day prepared, thinking about other students’ oral problems so that you can follow their presentations, and designing your own oral presentations so as to benefit your classmates.

During a classmates’ presentation, you are not off the hook. Your classmate is relying on you to help them if they have difficulty. You should ask questions if you are confused, make helpful suggestions, and learn from their presentation. Above all, treat the presenter with respect. Listen to what they have to say, and do not make disparaging comments. “I don’t quite understand what you did in that step,” is appropriate, “You didn’t explain that well,” or “You’re wrong” are not.

**Attendance at the Math Department Colloquium:**
According to math department policy, since you are enrolled in a 200-level mathematics course, you are required to attend at least 2 mathematics department colloquium talks. The goal of this requirement is to expose you to a wider range of mathematics, and to make you want to go to more than 2 talks! I hope you will decide by the end of the semester, as I have, that math talks are a lot of fun.

**Disabilities:**
If you have a documented disability for which accommodations may be required in this class, please contact me to discuss your needs. Additionally, you will need to register with Disability and Learning Services in the Bishop Wellness Center within the first two weeks of class. All such discussions will be confidential.
Academic Honesty:
Cheating and plagiarism are serious offenses and will be treated severely, in accordance with college policy. In addition, I am personally insulted by such behavior. So please don’t do it. These are the practices I expect you to follow in each of the components of the course:

**on the written and oral problems:** You may, and are encouraged to, discuss the homework with anyone, get help from your textbook, notes, computer algebra systems, etc. However, your submitted written work should be your own.

**on the individual problems:** You may consult your text and notes. You may not discuss the individual problems with anyone other than me.

**on the quizzes:** You may not consult any source other than me.