Syllabus
Transition to Advanced Mathematics
Math 201, section 1, CRN 20291
Spring 2010

Instructor:	Eric Gottlieb	**Meeting Place:**	225 OH
Office:	317 Ohlendorf	**Meeting Time:**	MWF 12 – 1
Office Hours:	MWF 1 – 2 TR 11 – 12	**Text:**	*Mathematical Proofs: A Transition to Advanced Mathematics*
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Course description: This class is intended to help you to make the leap from computational mathematics to proof-based mathematics. Computational mathematics often requires little more than the ability to commit a formula to memory and apply it to a particular case. Proving theorems (at least, the harder ones) requires creativity and the ability to see patterns and find unexpected connections. There is no tidy formula, no one size fits all approach, that will allow you to prove every theorem. There are many mathematical questions that remain unanswered despite the best efforts of some of the world's most brilliant minds.

Examples of computational mathematics include factoring polynomials, computing derivatives or integrals, and finding equations of tangent lines. Examples of proof-based mathematics include showing that the square root of 2 is irrational, establishing that there is a prime number between n and $2n$ for all positive integers n, and proving that if you have three or more points in the plane that are not all on the same line, then there must be a line that passes through two of the points and no others.

There are, however, standard proof techniques that can help you to frame your thinking. We will study a number of these, such as constructive proof, proof by cases, and proofs by contradiction and induction. We will study these techniques in a variety of mathematical settings, such as algebra, analysis, number theory, and combinatorics. Having an early exposure to these objects will hopefully assist you in your later mathematical education. Before we can do that, we will first need to become familiar with the fundamental objects of mathematics. These include sets, rules of logical inference, relations, and functions.

Along the way, we will learn about some facets of mathematical culture. We will discuss issues in the philosophy of mathematics, learn about some open problems, "meet" some famous mathematicians, and try to get a birds-eye view of the history and present condition of the mathematical enterprise.

We will discuss the features that make for good mathematical writing. We may learn a bit about how to use LaTeX, a software package based on Knuth's TeX that is used to typeset mathematical writing.

Material to be covered includes Chapters 0 – 10 and 13. This is an ambitious amount of material. I may ask you to read some of the sections on your own. I may also skip a section here or there depending on how quickly we progress.

Homework will be assigned and collected about once per week. If time permits, I will periodically call on students to present their solutions at the board. The rest of the class will discuss the solutions and suggest corrections or stylistic improvements.

Reports: There will be three writing assignments over the course of the semester. These will be based on reading assignments about various aspects of mathematical culture. The first will be on *A Mathematician's Apology,* by G. H. Hardy, and will be due on 8 February. The second will be on *Letters to a Young Mathematician,* by Ian Stewart, and will be due on 8 March. The third will be on *My Brain is Open,* by Bruce Schechter, and will be due on 16 April. Further instruction about the form of these assignments will be provided later.

Exams: There will be three in-class midterm exams and a comprehensive final exam, scheduled as shown below. The dates are firm but the material to be covered depends on our pace.

Exam	Date	Material to be covered
1	Friday 12 February	Chapters 1, 2, and 3
2	Friday 12 March	Chapters 4, 5, and 6
3	Friday 16 April	Chapters 7, 8, and 9
Final	Saturday 8 May 5:30 PM	Comprehensive with added emphasis on material not covered on earlier exams

Grading: Full credit will be granted when you show all of your work, when your reasoning is clear, and when I can read and understand what you have written. Writing is an important component of this class. Your grade will suffer if you include extraneous material, use poor grammar, or if your work is so messy or disorganized that I am unable to follow it.

Your final grade is determined as follows:

Midterm Exams:	16% each
Homework average:	16%
Reports:	5% each
Final Exam:	21%

The letter equivalent of your number grade is determined as follows:

93-100	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62	<59
A	A-	B+	B	B-	C+	C	C-	D+	D	D-	F

Attendance is not a formal part of your grade, but I may use attendance to decide borderline grades. If you miss more than four classes without adequate justification, I may ask the Dean to drop you from the class.

If you get stuck: I hope that you will work together on homework. However, you must understand and compose the work that you turn in. I am very happy to meet with you during office hours. I try to keep an open door policy, so feel free to stop by any time. If I am unable to meet with you, we can schedule another time.

Calculators will not be of much help, but you can use them unless I tell you otherwise.