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MATH 201-01, Transition to Advanced Mathematics, Fall 2012

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Syllabus
Math 201, Section 1
CRN 13367
Fall 2012

Instructor: Eric Gottlieb
Meetings: TR 2 – 3:15 in 225 Ohlendorf
Text: *Mathematical Proofs: A Transition to Advanced Mathematics*, 2nd ed.
Authors: Chartrand, Polimeni, and Zhang
Office: 317 Ohlendorf
Office Hours: MTWF 12:30 – 1:30
R 10:30 – 11:30
email: gottlieb@rhodes.edu

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 conjectures that remain unproved 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 there are infinitely many primes p so that $p+2$ is also prime.

We will first study the fundamental notions of mathematics, such as sets, rules of logical inference, relations, and functions. Then, we will explore standard proof techniques, including proofs by construction, cases, contradiction, and induction. We will study these methods in mathematical settings including algebra, analysis, number theory, and combinatorics.

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 will learn a bit about how to use LaTeX, a software package that is used to typeset mathematical writing. You will receive 5 percentage points of extra credit on each homework prepared using LaTeX.

Material to be covered includes most of Chapters 0 – 9 and part of Chapter 10. This is an ambitious amount of material, so we will maintain a brisk pace. I may ask you to read some of the sections on your own. I may skip a section here or there depending on how quickly we progress.

Homework will be assigned and collected regularly. You may discuss homework questions among yourselves, but you must understand and independently write the work you turn in. Late homework assignments may be declined or penalized at my discretion.

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 6 September. The second will be on *Letters to a Young Mathematician*, by Ian Stewart, and will be due on 2 October. The third will be on *My Brain is Open*, by Bruce Schechter, and will be due on 30 October. Further instruction about the form of these assignments will be provided later. Late reports may be declined or penalized.

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	Thursday 20 September	Chapters 1 and 2
2	Thursday 11 October	Chapters 3 and 4
3	Thursday 8 November	Chapters 5, 6, and 8.1 – 8.3
Final	Saturday 8 December 1 – 3:30 PM	Comprehensive with added emphasis on material not covered on earlier exams

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

Grading: Full credit will be granted when you show all of your work, your reasoning is clear, and 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, if you write poorly, or if your work is so messy or disorganized that I am unable to follow it. Your final score is weighted 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 may be used to decide borderline grades. If you miss five 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, but you must understand and compose the work that you turn in. I am 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.

The Honor Code: I take the Honor Code seriously and I expect you to do the same. All graded work must comply with the Honor Code. I reserve the right to give no credit for any assignment on which the Honor Council finds that a violation of the Honor Code has occurred.