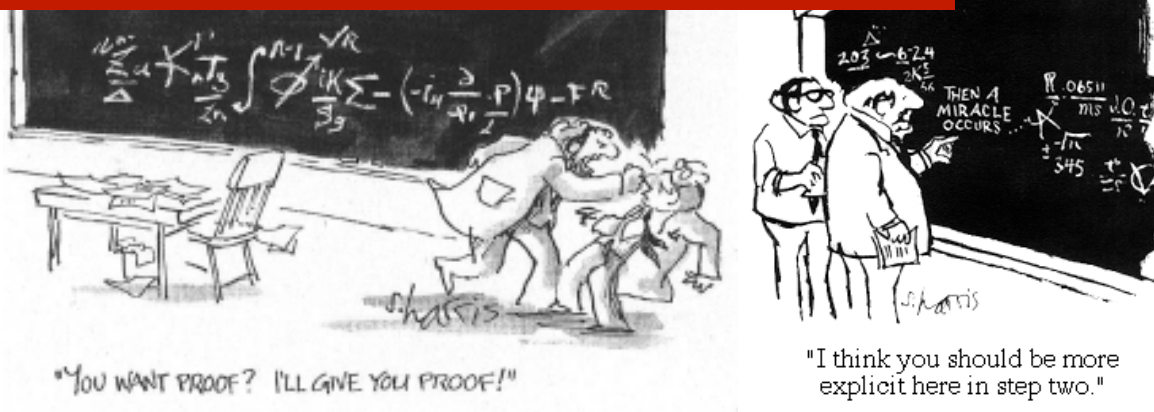


Math S-101. Spaces, Mappings, and Mathematical Reasoning: An Introduction to Proof



About Math S-101

Math S-101 is intended for students who are interested in learning more about math beyond calculus. The main goal of the course is to introduce the practice of higher mathematics, with minimal prerequisites. We will begin from a very basic standpoint and develop the tools that we need along the way to work through a number of theorems and proofs from the main branches of mathematics: topology, analysis, and algebra. You will learn about what it means to “do” math by learning how to turn your own observations and conjectures into formal statements backed up by rigorous arguments – proofs! We are also hopeful that along the way you will discover that doing mathematics is a creative (and enjoyable!) process.

Course Time and Meeting Place

TuWTh 9:30 -11:00 in Science Center 111

Section Times and Meeting Places

Monday at 7:00 - 8:00 PM in Science 221.

Friday at 3:00 - 4:00 PM in Science 221.

Course Description

There is more to mathematics than formulas and procedures. Ever wonder where a theorem comes from or why you should believe it? In this class, we start from some basic assumptions (no calculus necessary) and reason our way together until we convince ourselves of some surprising and sophisticated conclusions, including beautiful results from basic topology, analysis, and group theory. Prerequisites: Imagination, a solid mastery of precalculus, as well as a serious interest in making and critiquing arguments. Placement test recommended.

Course Web Site

The course web site is <http://www.courses.fas.harvard.edu/~sum31859>. The website will be used for most course administration issues, including homework assignment postings, posting of handouts, notes, problem session times, etc.

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Instructor

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Office Hours:

- TuTh at 11:00 A.M. to 12:00 P.M.
- Wed at 8:30 A.M. to 9:30 A.M.

Course Assistant

Abe Passaglia

Email: ampassag@fas.harvard.edu

Textbook, References, and Software

The textbook for this course is Robert S. Wolf. *Proof, Logic, and Conjecture: The Mathematician's Toolbox*. W. H. Freeman, New York, 1998. ISBN 0-7167-3050-2. Readings and some problems will be assigned out of the textbook, but will be taken from different sections of the book. The real textbook for the course will come as a series of notes that will be posted on the web as we progress through the course (along with some handouts in class).

Course Goals and Learning Objectives

The goals of this course are to:

- * Gain an appreciation of mathematical reasoning and proof.
- * Develop skills in structured mathematical reasoning and proof.
- * Develop a basic understanding of sets and point set topology.
- * Improve skills in learning and communicating mathematics with respect to the spoken and written word.

Upon successfully completing this course you should be able to

- * Apply the ideas of mathematical proof and reasoning in more advanced mathematics courses.
- * Understand and apply the basic ideas of point set topology, including closure operators, continuity, connectedness, and mappings,
- * Understand and be able to apply the Brouwer Fixed Point Theorem

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Grading

Your course grade will be determined by your homework (20%), class participation (20%), an in-class midterm examination (20%), a take-home midterm (20%), and a final exam (20%). We will drop your lowest homework score before calculating your final grade.

When we calculate your final grade at the end of the course, we will calculate a score on a 0-100 point scale using the scores that you have obtained during the course, and using the grade breakdown given below. Your course grade will then be obtained using this table. In the event of a fractional score, we will always round up to the nearest integer. We may modify these letter grades with a "+" or a "-" if we believe that your performance in the course warrants this.

| Range of Numerical Values | Corresponding Letter Grade |
|---------------------------|----------------------------|
| 100 - 90 | A |
| 89 - 80 | B |
| 79 - 65 | C |
| 64 - 50 | D |
| 49 - 0 | E |

Homework

The best way to learn math is by doing math, and the homework assignments for this class will be an important part of the course. There will be one or two homework sets due per week during the course. In order to make sure that everyone is keeping up during the semester, there will usually be no late homework accepted. Course assistants will normally grade your homework and return it to you within several days. Your lowest homework score from the semester will be dropped before grades are calculated.