

Welcome to Math 101!
Sets, Groups, and Topology

Philosophy:

The goal of this course is to introduce the practice of higher mathematics, with minimal prerequisites. Starting from scratch, we will develop some important theorems *and proofs* representing the three main branches of mathematics—geometry, analysis, and algebra. You will learn how to create mathematics by turning your observations, guesses, and conjectures into formal statements backed by rigorous arguments.

Prerequisites:

In principle, there are no prerequisites other than a serious interest in mathematical reasoning. Some exposure to calculus may be helpful, but is not required. Math 21 or even Math 1 can be taken concurrently. However, Math 101 is *not* open to those who have taken or are taking either Math 25 or Math 55.

Syllabus:

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| Point Set Topology | (Closure Operators, Continuity, Connectedness, Homeomorphisms, The Game of Hex, Brouwer Fixed Point Theorem) |
| Iterated Maps | (The Complex Exponential, The Fundamental Theorem of Algebra, Newton's Method and its Fractals, Chaotic Dynamics if time permits) |
| Symmetry Groups | (Basic Group Theory, Some Impossibility Theorems, if time permits) |

Staff:

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| Daniel Goroff | Science Center 427, Telephone 495-2168
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Office Hours Mondays 11-1 and by appointment. |
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Meeting Times:

Tuesdays and Thursdays 10-11:30 *and* either Wednesdays 4-5 or Wednesdays 7-8.

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Sets, Maps, and Symmetry Groups

- Homework:** On Tuesdays, please bring in completed problems assigned the previous week. You then have two choices. Either hand it in directly for grading on a scale of 0 to 10, or, with the help of your section leader, switch with another student and write a critique of their paper to give that partner on Thursday. Switchers can then revise their problems set and hand in the original, its critique, and their revisions in their section leader's box at the Math Department by Friday afternoon. You will then receive 0 to 10 points for your revised work, and -5 to 5 points for the critique you wrote of your partner's draft. Do not switch with the same person more than once during the term.
- Late Policy:** Late homework need not be accepted for grading.
- Group Projects:** The last part of section meetings will usually be devoted to a group project. Topics to work on will be handed out that you can begin working on together with a few other students. Section leaders will assign groups during the first half of the course. You may form your own during the second. Four times during the semester you should participate in a group that eventually hands in its work. Everyone in that group will receive the same grade out of a possible 15 points.
- Collaboration:** We encourage collaboration on assignments. However, you must write up your homework problems in your own words and, as in all scholarly work, explicitly acknowledge sources consulted. Group projects should not only list all members who contributed, but also acknowledge help received from outside the group.
- Midterm:** There will be one midterm, worth up to 60 points.
- Grades:** By completing homework, critiques, group projects and the midterm, you can earn up to approximately 170 points during the semester. Your final exam will be worth the difference between a fixed target of 200 points and the total number of points you accumulated during the term. Thus, each point missed during the term is, in principle, recoverable on the final. To diminish competition, there is no strict curve. Roughly, we expect those who end up with at least 90% of the target to receive an A of some kind, at least 80% to correspond to some kind of B, etc.
- Sources:** Notes will be available in class and on the web. The textbook, *Proof, Logic, and Conjecture* by Robert S. Wolf is available at the Coop.