

Math 109A—Introduction to Geometry and Topology

<http://www.math.caltech.edu/~ma109a>

Location: 257 Sloan

Times: MWF 10am

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Course Objective: Math 109a is the first of three courses in the 109 sequence, and is an introduction to topology.

We start by defining topological spaces, considered in the abstract. This will include such topics as compactness and Hausdorff spaces, some basic constructions and a hint at the myriad pathologies in arbitrary topological spaces. The second part of the course concerns homotopy and the fundamental group. We will cover topics such as: the fundamental group; covering spaces; group presentations; van Kampen's theorem. The third part covers homology (and maybe some cohomology, time permitting). This will largely cover the definition of the simplicial and singular homologies, with examples and applications. Along the way, we'll see such things as simplicial and cell complexes, manifolds and basic topological constructions such as products, quotients, suspensions, joins and wedges.

Prerequisites: Ma 2 or equivalent, and Ma 108 must be taken previously or concurrently.

Text: Vassiliev, *Introduction to Topology*, 1st edition, AMS, 2001. We will take a somewhat different approach to that of Vassiliev (with appropriate references given for such divergence), so the assessment may cover topics from lectures which are not in Vassiliev. Other references supplied in first class.

Hatcher, *Algebraic Topology*, freely available online at

<http://www.math.cornell.edu/~hatcher/AT/ATpage.html>

is also highly recommended.

Grading Policy: Weekly homework (30%), a midterm (30%) and a final (40%).

Homework policy: Homework is due in class on Wednesdays. At most one late homework set will be accepted. Except in unusual circumstances, homework will not be accepted more than a week late. You should see the instructor in advance if it is necessary to turn in homework late.

Collaboration policy: You may discuss homework problems with other students, but solutions should be written up individually in your own words. Take-home exams must be your own work, with outside references properly attributed.