

The George Washington University
New Graduate Mathematics Course
Math 272 (CRN 73319): Topics in Logic
Topics in Set Theory
Fall 2006
TuTh 12:45pm–2:00pm
1957 E Street, Room B14
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Set theory was founded by George Cantor who proved that there are infinitely many infinities. The smallest infinity is the size of the set of natural numbers. Cantor showed that, while there are as many rational numbers as natural numbers, there are more real than natural numbers. Is there an intermediate infinity? A negative answer to this question is known as the *continuum hypothesis*.

In 1963, Paul Cohen obtained a dramatic result, which was “rather unsatisfactory to an average mathematician,” by establishing that the continuum hypothesis is *independent*, that is, neither provable nor refutable from the ordinary set-theoretic axioms. Another mathematical principle which the ordinary set-theoretic axioms fail to settle is the *axiom of choice*. The independence proofs use the *forcing* technique for which Cohen won the Field’s medal.

The course will start with infinitary combinatorics. It will then develop forcing as a general technique for producing models satisfying diverse mathematical properties. The forcing will be applied to a variety of mathematical problems. The choice of particular topics and the method of presentation will take into consideration the background and the interest of the students.

- **Required background**

Mathematical maturity. Familiarity with formal mathematical languages and elementary set theory. Math 272 can be taken for credit repeatedly.

- **Textbook**

Set Theory: An Introduction to Independence Proofs by Kenneth Kunen, North-Holland, 1983.

Other reading material will be provided in class.