

The George Washington University  
Columbian College of Arts and Sciences  
Dean's Seminar for First-Year Students  
MATH 801-11, CRN 75030  
**Mathematics of the Infinite**  
FALL 2006  
TuTh 2:20pm–3:35pm  
Duques Hall (2201 G Street), Room 360

- Valentina Harizanov  
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- **Office hours:** Tuesdays 3:45–4:45p.m.  
Thursdays 11:30a.m.–12:30p.m.  
Other times by appointment  
Any time by e-mail
- **Math Department**  
Old Main (1922 F Street), Room #102  
Phone: (202) 994–6235
- **Description**

We will explore the infinitely large and the infinitely small using the exact methods of mathematics. For infinitely large we will first present the mathematical theory of infinity from the perspective of modern set theory founded by Cantor at the beginning of the 20th century. We will discuss Zeno's Paradox, Hilbert's infinite hotel, Koch's snowflake curve, and study the smallest infinite size, infinite hierarchy of infinities, infinite arithmetic, continuum, and important statements about infinite numbers that are neither provable nor disprovable.

For the infinitely small numbers, we will present the nontraditional approach to calculus based on A. Robinson's rigorous theory of infinitesimals developed in 1960, using methods from model theory. We

will show how Leibniz and Newton developed calculus in the 17th century using the intuitive concept of an infinitesimal, but failed to offer rigorous foundation.

The course will incorporate some history and philosophy of mathematics and will include readings from original texts. It will attempt to illustrate gradual and painstaking development of brilliant ideas, and show great courage of exceptional minds in resisting attacks from powerful contemporaries.

Students, divided in groups, will work together on projects. No math background is required beyond high school algebra.

- **Reading material**

*Infinity and the Mind* by Rudy Rucker, Princeton University Press, 1995.

Other reading material will be provided in class.

- **Grading**

Final Exam: 30%

Midterm Exam: 20%

Take-Home Assignments: 28%

Attendance, class participation, and in-class group projects: 22%