

Block D+: Tuesdays and Thursdays 10:30–11:45

Instructor: Mary Glaser

Office hours (Fall 2007): Thursday 2:30-4, Friday 11-12

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Prerequisite: Instructor's permission. Some calculus background is required. Strong preference will be given to sophomores who would like to explore the possibility of majoring in mathematics, or have already decided to major in mathematics.

Text: Martin Liebeck, "A Concise Introduction to Pure Mathematics", 2nd Edition ISBN 1-58488-547-5

Description:

This course is intended to prepare students for more advanced mathematics courses by offering practice in reading and writing proofs. The following are some examples of theorems that we will study.

- (1) There are infinitely many prime numbers.
- (2) $\sqrt{2}$ is an irrational number.
- (3) Euler's polyhedron theorem: If a convex polyhedron has f faces, e edges, and v vertices, then $f - e + v = 2$.
- (4) There is no sequence x_1, x_2, x_3, \dots of real numbers with the property that every real number x appears at least once in the sequence. One might loosely summarize this by saying that the set of real numbers is "more infinite" than the set of natural numbers.
- (5) De Moivre's formula: $(\cos \theta + i \sin \theta)^n = \cos(n\theta) + i \sin(n\theta)$.

The course will include a brief introduction to complex numbers, and in particular you will learn a proper definition of the imaginary unit $i = \sqrt{-1}$. Studying these and many other examples, you will learn broadly useful tools of precise thinking: Propositional logic, quantifiers, indirect proof, proof by mathematical induction, domain and range of a mapping, injectivity and surjectivity of mappings, and so on. Through extensive practice, you will improve your ability to find and write proofs yourself.