

MATHEMATICS 300-INTRODUCTION TO ABSTRACT
MATHEMATICS

Time/Place: Tuesday+Thursday, 9:40-10:55, Ayres 121

Instructor: Dr. Alex Freire, Ayres 325, 974-4313, freire@math.utk.edu.
Office hours: Tu+Th 2:15-3:15, or by appointment.

Goal: Introduction to the analysis of mathematical problems. By the end of the course, students should be able to *create* proofs of mathematical statements with good standards of rigor and precision. *The method is to “learn by doing”*. Examples will be drawn from the theory of sets, proofs by induction and properties of the real number system.

Text: How to Prove It—A Structured Approach, by Daniel J. Velleman (2nd. ed., Cambridge U.P., 2006)

Structure of the lectures. (a) At the beginning of each lecture, students will present their solutions to some of the preassigned problems at the board, followed by a critique.

(b) The concepts needed for the next assignment will be introduced (however, I will often rely on students individually reading the text).

(c) At the end of the class, a *written* homework assignment will be given (one or two problems.) This must be handed in at the beginning of the next class period.

Grading. Based on homework and participation in (a) (30%), two in-class exams (*no makeups*, 20% each) and a final exam (30%). *Expected* grading scale: 85-100: A or A-; 70 to 84: B+,B, B-; 55 to 69: C+,C, C-.

Remarks: (i) use of laptops, cellular phones or other electronic devices is *not permitted* during lecture. (ii) Attendance to every lecture will be *assumed*.

Students with disabilities: please contact the Office of Disability Services (2227 Dunford Hall, 974-6087 V/T) if you need special arrangements for this class.

Topics (tentative)

- 1) Basic logic, set theory: connectives, quantifiers, operations on sets
- 2) Relations and functions: order relations, equivalence relations
- 3) Proofs by induction
- 4) Infinite sets: countable and uncountable sets
- 5) The real numbers: field axioms, archimedean ordering, completeness