

Course Syllabus
Math 2030---Fall 2009

Instructor: Dr. Neal Smith

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Office Hours: How about 8:00-10:30 MW and by appointment. It is the responsibility of each student to seek help when necessary.

Text: A Transition to Advanced Mathematics (6th ed.) by D. Smith, M. Eggen, and R. St. Andre. We will cover most of the material in chapters 1-5 of this text, plus possibly some supplemental topics here and there.

Grading: Your grade will be determined by your performance on 2 'mid-term' exams, homework and a final exam; each mid-term will count for 30% of your grade, the final 30%, and homework will count for the remaining 10%.

<u>If your final percentage is in the interval...</u>	<u>Your course grade is...</u>
[80%, 100%]	A
[70%, 80%)	B
[60%, 70%)	C
[50%, 60%)	D
[0%, 50%)	F

Other Policies:

Attendance: I'm not the attendance police, but you need to be here every day. Now that you're in the world of upper-division courses, frivolous absence is a very bad thing. You never know if you might want someone to write you a recommendation letter someday. If you know you will be absent on a given day for a legitimate purpose, you should notify me in advance.

Make-ups: I do not like to do make-ups. If you know you're going to be gone at some point (for a non-trivial reason) when exam-time nears, let me know well in advance, so I can schedule the exam appropriately.

Objectives: Students will demonstrate the ability to write correct and well-written mathematical proofs and the ability to read and critically evaluate the correctness of proofs. Students will also show a working knowledge of a variety of basic mathematical tools including (but not limited to): quantification, properties of sets, functions and relations, mathematical induction, and properties of cardinal numbers.

Grading philosophy: On homework and exams, problems will typically be evaluated with the following rubric in mind.

5-The problem is completely correct, beyond any reproach.

4-The problem is 'almost correct', but there may be some problems with a minor detail. Or, the solution is correct but is not as well-written as it should be.

3-The key idea is there, but there may be a serious error. Or, the problem is correct but the solution is very poorly written.

2-*Some* headway has been made on the problem, but there is not a complete solution on the page.

1-The writeup reflects that the writer knows what the problem is asking for, and the writer seems to have some clue as to how to proceed, but little to no actual progress has been made towards a solution.

0-Speaks for itself. What is written down is of no value with regard to a solution to the problem.

Honor Statement: Each student is responsible for maintaining academic honesty as specified in the ASU catalog. You are free to work with others on homework assignments, but homework handed in should be your own; simply copying the work of another verbatim constitutes academic dishonesty. On any assignment which is designated as a 'take-home exam' or portion thereof, there shall be **no collaboration of any kind** between students. Instances of academic dishonesty will be dealt with as specified in the ASU catalog.

Etiquette: Please be punctual and make sure your cell phone is turned off before coming to class. If the lid of your laptop is open, then you will likely be asked to produce your beautifully typed and formatted notes of everything I've said to share with your classmates.

Withdrawals: If you decide, for whatever reason, to drop the course you have the responsibility of making sure you have filled out the necessary forms and collected the necessary signatures by the withdrawal deadline. Extended non-attendance will not necessarily cause me to drop you from the class roll.

Tentative Course Outline:

I. Preliminaries

- a. Logical propositions and conditionals
- b. Quantification and negation of logical statements
- c. Logical tautologies
- d. Basic proof methods: direct and indirect

II. Basic set theory

- a. The "definition" of a set
- b. Operations on sets and set relations
- c. The power set of a set
- d. Indexed collections of sets

III. Mathematical Induction

- a. The Principle of Mathematical Induction
- b. The Well-Ordering Principle
- c. Intuitive pratfalls of induction (Sorites paradox)

*****Exam 1 should happen around this point*****

IV. More advanced set theoretic topics, functions, and relations on a set

- a. Cartesian products of sets
- b. Relations on a set
- c. Special properties of relations: reflexivity, symmetry, antisymmetry, and transitivity
- d. Equivalence relations and partitions
- e. Partial orders on a set
- f. The Hasse diagram of a poset
- g. Functions, one-to-one functions, and onto functions
- h. The image and preimage of a set under a function

*****Exam 2 should happen around this point*****

V. The cardinality of a set

- a. Finite vs. infinite sets
- b. Properties of infinite sets
- c. Countably infinite vs. uncountably infinite sets
- d. Basic rules of cardinal arithmetic
- e. The Axiom of Choice
- f. Objections to the Axiom of Choice

Assigned homework

Unless otherwise indicated, you should do all parts of each problem.

Section	Exercises
1.1	2, 3, 4, 8, 10
1.2	4, 5, 6, 9, 14
1.3	5, 6, 7, 9
1.4	1, 5, 6, 8, 11
1.5	4, 5, 7, 9, 10, 12
1.6	1, 3, 5, 8
1.7	3 (a,b only), 5a, 5b, 12f, 12g
2.1	4, 7, 9, 14, 19
2.2	1, 8, 13, 14, 15, 17
2.3	1, 18, 19, 20
2.4	8 (a, b, e, g, i, m, t, u, v), 9a, 10, 11, 13, 15
2.5	1, 2, 4, 12, 15
3.1	1, 2, 3, 5, 9, 12, 15, 20
3.2	2, 4, 8, 11, 16
3.3	3, 4, 7, 15 (a-c)
3.4	3, 8, 9, 12, 16, 22
4.1	4, 6, 14, 16, 18
4.3	1, 2, 4, 7, 8, 17
4.4	2, 3, 8, 15, 22
5.1	3, 5, 16
5.2	5, 7, 10, 11, 12
5.3	3, 8b, 13, 14, 16
5.4	14, 17
5.5	TBA