Mathematics MAT 305 : Fundamental Structures of Mathematics
Fall 2012
TR 10:00 a.m. - 11:15 a.m., Hubbard 206

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Course Materials

A Transition to Advanced Mathematics, Sixth Edition, Smith, Eggen, St. Andre (required)

Introduction

This course is designed to give you the required background material to be able to explore more advanced areas of mathematics. By now you have taken Algebra, Geometry, Calculus and perhaps a half-dozen other intimidating sounding math classes. In those classes you learned a certain aspect of mathematical problem solving. That is, you learned how to formulate a problem mathematically and solve it using the computational tools taught in those courses.

At this point in our mathematical education our focus shifts from being able to come up with the right answer to a problem to being able to *prove* that our techniques are correct. That is correct. We are going to prove things in this course.

Most advanced courses in mathematics requires us to precisely formulate our problems. And so we need a precise language to do this. It is this language that we will be learning in this course. We will learn the elementary rules of logic, set theory, equivalence relations, and functions and how these rules fit into our framework of mathematics.

Exams

There will be two in-class exams as well as a final cumulative exam. The exams will test your ability to work through some of the computations, as well as your ability to apply the techniques to certain applications. The first exam is scheduled for Thursday, September 27, the second exam is scheduled for Thursday, November 1. The final exam will be held on Thursday, December 13 from 9:00 - 12:00. All exams will count for 25 percent of your final grade. There will be NO make-ups for missed exams. Please look over your schedule as soon as possible. If you see a potential conflict, inform me immediately.

Homework

The best way to learn Mathematics is to solve problems. At the end of each section, there are a variety of exercises that you can look at to help understand concepts and hone your skills. I will suggest problems for you to attempt from the end of the section, but I will not grade these. Instead, I will assign weekly problem sheets that will be collected and graded. These problems will be more in-depth than the drill-type activities and will require more exposition on your part. You will be graded on content, organization and completion of the assignments. In addition to the graded problems, each assignment will carry 5 completion points. To earn 5 out of 5 of the completion points, the assignment must be written up neatly and thoroughly with complete solutions to all of the assigned problems. Late homework will not be graded, but you may still earn completion points on late assignments. The homework is designed to help you identify where you might have difficulties. If you encounter any trouble with an assignment or a concept, seek help!

Attendance

Attendance in MAT 305 is extremely important. Although there is no official attendance policy, note that if you are not in class on a particular day, your homework will not be graded for a score. I will also require that you be in class at 10:00 a.m. and no later. If you are late to class, you may stay to enjoy the wonderful learning experience. However, your homework assignment for the day will be considered late.

Grading

Your grade in this course will be based on two main factors: homework, and exams. The homework will be worth 25% of your final grade and the exams 75%. In addition to these factors, minor ethereal factors such attendance, class participation, attitude, and improvement over the course of the semester can also

affect your grade. To determine your final grade, 90–100% = A, 80–89% = B, 70–79% = C, 60–69% = D, 59 and below = F, with the top two percents receiving a + and the bottom two percents receiving a −.

Calculators

Because this course is not computational based in any manner, the use of calculators is not allowed.

Important Dates

Thursday, September 27 – Exam I
Thursday, November 1 – Exam II
Thursday, November 22 – `NO CLASS`
Thursday, December 6 – Last Day of Class
Thursday, December 13 – 9:00 a.m. - 12:00 p.m. – Final Exam

Suggestions

Come to class with your homework assignment completed every day
Study for at least 2 hours each day in addition to completing your homework assignment
Read the section we will be covering in class *before* arriving to class
Do not fall behind!
Come to office hours to discuss homework and concepts. I am here to help!

Syllabus
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Week 1	August 28	Course Policies, Syllabus, Section 1.1
	August 30	Section 1.2 – Conditionals and Biconditionals
Week 2	September 4	Section 1.3 – Quantifiers
	September 6	Section 1.4 – Basic Proof Methods I
Week 3	September 11	Section 1.5 – Basic Proof Methods II
	September 13	Section 1.6 – Proofs Involving Quantifiers
Week 4	September 18	Section 2.1 – Basic Concepts of Set Theory
	September 20	Section 2.2 – Set Operations, Review
Week 5	September 25	Section 2.3 – Extended Set Operations and Indexed Families of Sets
	September 27	**Exam I**
Week 6	October 2	Sections 2.4 – Induction
	October 4	Sections 2.5 – Equivalent Forms of Induction
Week 7	October 9	Section 2.6 – Principles of Counting
	October 11	Section 3.1 – Cartesian Products and Relations
Week 8	October 16	Section 3.2 – Equivalence Relations
	October 18	Section 3.3 – Partitions
Week 9	October 23	Section 3.4 – Ordering Relations
	October 25	Section 4.1 – Functions as Relations
Week 10	October 30	Sections 4.2 – Constructions of Functions
	November 1	**Exam II**
Week 11	November 6	Sections 4.3 – One-to-one and Onto Functions
	November 8	Section 4.4 – Images of Sets
Week 12	November 13	Section 4.5 – Sequences
	November 15	Section 5.1 – Equivalent Sets; Finite Sets
Week 13	November 20	Sections 5.2 – Infinite Sets
	November 22	`NO CLASS`
Week 14	November 27	Section 5.3 – Countable Sets
	November 29	Section 5.4 – The Ordering of Cardinal Numbers
Week 15	December 4	Section 5.5 – Comparability of Cardinal Numbers
	December 6	Section 5.5 – The Axiom of Choice