MAT319

Foundations of Analysis
Spring, 2003

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IK Office Hours: Tuesdays 4-5 and Thursdays 10-11 in 4-111, Wednesdays 11-12 in Undergraduate Office, and by appointment.
WPH Office Hours: Tuesdays at 1 in the MLC, Wednesdays and Fridays at 1 in 2-115, and by appointment.

Course meets: Tuesdays and Thursdays 2:20-3:40 in Light Eng 154.
Recitation meetings: Wednesday and Fridays 2:15-3:10 in Libr N4006.

Textbook: David F. Belding and Kevin J. Mitchell. *Foundations of Analysis*. Prentice Hall.
Course web page: http://www.math.sunysb.edu/~irwin/mat319S03.html/

Course Description: This class is an introductory approach to analysis. It is sometimes called "Calculus done right." It is one of the courses that introduces students to the concepts of mathematical proofs and rigorous precise arguments.

Understanding and Proofs: The main aims of the course are for students to learn the intellectual issues involved in the foundations of analysis (calculus) and to be able to prove basic facts about calculus. Students are expected to master the concepts of calculus. With regard to proofs, we will proceed

slowly – beginning with little emphasis on proofs for the material of Chapter 1 and proceeding to quite a heavy emphasis in Chapter 4.

Prerequisite: MAT 200 (where students should have learned what a mathematical proof or argument is); one of the following: MAT 203, 205, 211, or AMS 261 or A- or higher in MAT 127, 132, 142 or AMS 161. Students who have not completed the prerequisites need the permission of the instructor to register for the course.

Relation to MAT 320: There is a nontrivial overlap in the material of MAT 319 and MAT 320; only one of these two courses may be used to satisfy requirements. Material appearing in both courses is normally covered at a faster pace in MAT 320. Certain topics is MAT 319 are especially appropriate for students interested in teaching mathematics at the high school level. Students who want to take certain advanced analysis courses (for example, MAT 322 and MAT 324) must take MAT 320.

Approximate schedule

Topic	**Sections in textbook**	**Number of Lectures**
The Real Number System	1.1 – 1.4	4
Functions, Limits, Continuity	2.1 – 2.6	8
Differentiation and Integration	3.1 – 3.7	8
Sequences and Series	4.1 – 4.6	6
	TOTAL	26

Homework: Homework is of extreme importance in all mathematics courses – this one is no exception. Problems will be assigned periodically that should be handed in by the due-date to the recitation instructor. You should try to solve them by yourself. You should also discuss them with your fellow students and you may work together on each problem set, but what you hand in must be your own writing and you should be able to answer questions about its content. The solutions of homework problems can and usually will be discussed (after the due date) in lectures and more appropriately in recitation sections. Some of the homework problems will be graded and

solutions to many of them will be posted on the web. LATE HOMEWORKS WILL NOT BE ACCEPTED.

Pretest: A pretest on Thursday, January 30, will test you readiness, based on the mathematics you were supposed to learn in the prerequisite courses, to take this course. You performance on the pretest and the first midterm examination (on February 25) should determine whether or not you should drop this course.

Quizzes: There will five short (15 minutes) quizzes given during recitation sessions on dates shown in the "Contents of Recitation Sessions" section below. Each quiz will consist of two true or false questions and three other questions on precise definitions, statements of results or routine calculations. All the questions are to be based on the material covered during the previous two weeks. MAKEUP QUIZZES WILL NOT BE AVAILABLE. Quiz answers with explanations will be posted on the web.

Exams: There will be two midterm examinations (on Tuesday, 2/25 and Thursday, 4/10) and a final exam (on Tuesday, 5/20). All examinations are inclusive in the sense that they will cover all the material studied up to a specified date. The exact area of coverage of each examination will be posted on the web (in the course announcement section). After the graded papers are returned to the students, the midterm examinations with solutions will be posted on the web.

Mathematics upper division writing requirement: One of the components of the upper division writing requirement in Mathematics is "a graded final exam for which the student wrote sufficiently many mathematical proofs." A midterm exam may be substituted for a final. The second midterm examination augmented by proofs of two additional theorems may serve this purpose. Students who wish to satisfy a portion of the upper division writing requirement with this exam, will rewrite at home the expanded examination using proper grammatical constructions and presenting clear well written expositions of the proofs. The approval of the augmented examination as meeting part of the upper division writing requirement will also increase the student's grade on the second midterm examination by 10 points (thus a perfect score for such an examination with the writing components will be 110 out of 100).

Grades: The final grade will be based on all the work appropriately weighted: midterm examination (15% each), the final examination (25%), the pretest (5%), homework (20%) and quizzes (20%). In computing the homework grade component, the item with the lowest score will be dropped.

Note 1: If you have a physical, psychological, medical or learning disability that may affect your ability to carry out assigned course work, you are urged to contact the staff in the Disabled Student Services Office (DSS), Room 133 Humanities, 632-6748/TDD. DSS will review your concerns and determine, with you, what accommodations might be necessary and appropriate. The course instructor will use the recommendation of the Disabled Student Services Office to decide what special arrangements might be needed. All information and documentation of disability is confidential.

Note 2: The next two tables show the material covered in each lecture and each recitation session as well as the plans for the next lecture and the next recitation session. Students should read the appropriate sections of the book before each lecture and do the appropriate problems before each recitation session. We may only have enough time to discuss in class and recitation sessions some of the material. You are, however, responsible for all the material – even if not covered in either lecture or recitation sessions. If you do not understand something, you are encouraged to ask question during lectures, during recitation sessions, and during office hours of the lecturer and of the recitation instructor.

Contents of Lectures

Day	Date	Sections of book
Th	1/23	Discussion of what is expected (2); 1.1 and 1.2
Tu	1/28	1.2 and 1.3
Th	1/30	1.3 and Pretest
Tu	2/4	1.4
Th	2/6	2.1 and 2.2
Tu	2/11	2.2 and 2.3
Th	2/13	2.3 and 2.4
Tu	2/18	No class because of snow emergency
Th	2/20	2.5 and 2.6
Tu	2/25	Midterm Examination #1
Th	2/27	2.6 and 3.1
Tu	3/4	3.1 and 3.2
Th	3/6	3.2 and 3.3
Tu	3/11	3.3 and 3.4
Th	3/13	3.4 and 3.5
Tu	3/25	3.5 and 3.6
Th	3/27	3.6 and 3.7
Tu	4/1	3.7
Th	4/3	4.1 and 4.2
Tu	4/8	4.2 and 4.3
Th	4/10	Midterm Examination #2
Tu	4/15	4.3
Tu	4/22	4.3
Th	4/24	4.4
Tu	4/29	4.5
Th	5/1	4.5
Tu	5/6	4.6
Th	5/8	4.6
Tu	5/20	Final Examination

Contents of Recitation Sessions

Day	Date	Problems or sections reviewed
W	1/22	Discussion of what is expected (1); calculus review
F	1/24	Review of fundamental theorem of calculus; Section 1.1: Probs 3,7,8,10,14,22
W	1/29	Discuss 1.2; Problems 1.2:11,14 and 1.3:12,18
F	1/31	Problems from 1.2 and 1.3 and Quiz #1
W	2/5	Review Pretest; Problems 1.4: 4,6,9,11,12; Collect HW #1
F	2/7	Classes cancelled because of snow.
W	2/12	Review Quiz #1 and HW #1; Problems from 2.1 and 2.2
F	2/14	Review HW #1, Problems from 2.3 and 2.4 and Quiz #2
W	2/19	Review HW from 1.4, Problems from 2.4 and 2.5
F	2/21	Review Quiz #2 and HW #2, Problems from 2.6
W	2/26	Review of Mid-term Examination
F	2/28	Problems from 2.5 and 2.6
W	3/5	Problems 3.1 #2, 4, 7 and 3.2 #4, 6, 8
F	3/7	Problems from 3.3
W	3/12	Review of 3.4 and Quiz #3
F	3/14	Problems from 3.4 and 3.3; Review HW #3
W	3/26	Problems from 3.5
F	3/28	Problems from 3.6
W	4/2	Problems from 3.7 and Quiz #4
F	4/4	Review of Q4 and Ch. 3, problems from 4.1
W	4/9	Review of HW4 and Ch. 3, problems from 4.2
F	4/11	Problems from 4.2
W	4/23	Problems from 4.1, 4.2 and 4.3
F	4/25	Problems from 4.3 and 4.4
W	4/30	Problems from 4.5 and Quiz #5
F	5/2	Problems from 4.6
W	5/7	Problems from 4.6
F	5/9	Problems from 4.6 and review HW #6