Math 312 **MTRF 12:00, MH108** **SPRING 2009**

Instructor: Dr. Richard J. Gardner.

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Office Hours: MTRF 9:30–10:30 a.m., or by appointment.

Prerequisites: Math 226 and either Math 209 or Math 302.

Text: *Mappings and Continuity*, by Don Chalice.

Syllabus: The basic goal is to reach the Intermediate Value Theorem.

Exams: Midterms on May 1 and May 22.

Grading: Coursework 50%
Midterms* 50%

* The higher midterm score counts 35% and the lower midterm score counts 15%.

Please note: No make-ups or late exams will be given. Once you take an exam, the score is recorded and cannot be adjusted or replaced under any circumstances. So, if you feel too ill to take an exam, DO NOT take it, but bring a doctor's certificate to me when you feel better and arrangements will be made.

Coursework: Will be based on exercises and theorems proved in class. After a few introductory classes, the quarter will be divided into three periods:

Period 1:	April 7 to April 23
Period 2:	April 24 to May 12
Period 3:	May 14 to June 5

A grade will be assigned for each period, and the overall coursework grade will be based on the sum of these three grades. Most of the grade in each period is based on theorems rather than exercises. Each presentation is awarded X, 3, 4, or 5. Here, 3 means some part of the proof is redeemable, 4 means there is only one gap, and 5 is given for a completely acceptable proof; X means the proof is unacceptable. The number measures quality of presentation as well as correctness. For example, you may present a correct argument ineptly and receive a 4.

No other text (including notes from other courses), no other source of material (such as the internet), and no individual other than the instructor may be consulted at any time before a theorem is proved in class. It is your responsibility to record correct proofs presented by other students in class.

Cell phones must be turned off during class time.

Course Objectives

The successful student will demonstrate:

1. Understanding of the notation and basic rules of set theory and ability to use them.

2. Knowledge of the definitions and basic results on countable and uncountable sets in the plane, the Cantor set, and the Shroeder-Bernstein Theorem.

3. Knowledge of the definitions and basic results concerning open and closed sets in the plane, including terms such as cluster point, boundary, and closure.

4. Knowledge of the definitions and basic results concerning relatively open and closed sets and connectedness in the plane, including terms such as separated sets and component.

5. Knowledge of the Least Upper Bound Axiom for the real line and some equivalent statements, including the definitions of upper and lower bound, supremum, infimum, bounded set, and interval.

6. Knowledge of the definitions and basic results concerning sequences in the plane, including increasing and decreasing sequences of real numbers, convergent sequences, Cauchy sequences, subsequences, and adherent points.

7. Knowledge of the definitions and basic results concerning compactness in the plane, including nested sequences of sets, open covers, the Heine-Borel property, and distance between sets.

8. Knowledge of the definitions and basic results concerning continuous functions on the plane, including the Maximum Theorem and Intermediate Value Theorem.

9. Ability to construct proofs of statements involving the above topics and present these proofs at the blackboard, with due attention to clarity of argument and style of presentation, including proper use of grammar and punctuation.

Relation to Overall Program Goals

Among other things, this course will

(i) enhance your problem-solving skills;

(ii) improve your ability to communicate mathematical arguments clearly, both orally and in writing;

(iii) help you understand the importance of abstraction and rigor in mathematics, construct complete proofs, and critically examine logical arguments;

(iv) inform you about the historical context of the area of mathematics studied.