Advanced Calculus
MATH472

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Students on UI Moscow campus in fall and spring: You are encouraged to make appointments with me or use my office hours (posted on my office door) to get help with the material. I'll be happy to clarify any ambiguity in the lectures and to give pointers if you are stuck on a particular problem, however, I shall not work on your homework assignment with you nor will I check your solutions for errors in my office.

All students: When a meeting is not possible, do not hesitate to communicate any issues by email. Please follow some basic email courtesy. Emails without any address or signature can be ignored.

Recommended Text: Patrick M. Fitzpatrick, *Advanced Calculus,* 2nd Edition.

Course Webpage: www.webpages.uidaho.edu/sdatta/EOmath472.html

Course topics:

- Infinite series; sequences and series of functions
- The space $\mathbb{R}^n$: convergence of sequences in $\mathbb{R}^n$, and open and closed sets in $\mathbb{R}^n$
- Limits and continuity of functions of several variables
- Differentiating functions of several variables: partial derivatives and directional derivatives, the Implicit Function Theorem
- Local approximation of functions of several variables
- Integrating functions of several variables; Fubini's Theorem

Assignments, exams & grading:
Your grade in the course will be based on the following:
Homework - 20%
Midterm I (50 minutes) - 25% (after Lecture 12)
Midterm II (50 minutes) - 25% (after Lecture 28)
Final (2 hours) - 30%

All exams will be closed-book, closed-notes, and calculators will not be allowed. The final exam is comprehensive.
Part of your grade will be based on neatness and correct mathematical notation. Your work should be organized and easy for me to read or else you

will lose points.

Important deadlines: The following are the deadlines by which the above exams must be taken and returned by the proctor to the EO office:

For Fall:
Midterm I: October 15
Midterm II: November 20

For Spring:
Midterm I: March 1
Midterm II: April 15

For Summer:
Midterm I: July 5
Midterm II: July 25

Unless you have taken my permission, you should strictly abide by the dates given above. You can take a test on any day before the corresponding due date. The exams must be received by the EO office **by** the above dates, otherwise, your score for the exam will be automatically set to zero. Please make a note of the above dates so that you can make arrangements with your proctor.

As soon as you finish a lecture, work on the related problems from the assignments. You should work on the assignments alongside the lectures and turn them in as you finish. In particular, you must ensure that all HWs pertaining to a certain midterm are submitted **before** that midterm. If your assignments are poorly timed, (for example, HW 1 is submitted after Midterm 2), or turned in one batch before tests or towards the end of the semester, they will **not** be considered. Besides, in such cases, I will **not** be able to provide any feedback or inform you of your HW grades.

Please scan (if handwritten) and email me your assignments in a **single** pdf. Camera shots of pages will **not** be accepted. Write your name, course name/no., and assignment no. in the subject of the email.

Learning Outcomes:

- Students will learn how to determine convergence of a series (infinite sum) of numbers. They will learn about sequences of functions, series of functions, and various tests to determine the convergence of series of functions. They will learn about different types of convergence like pointwise and uniform convergence.
- Students will learn several important theorems which give conditions under which important properties of functions like continuity, differen-

tiability, and integrability are carried over to the infinite sum of such functions.

- Students will learn about open sets, closed sets in $\mathbb{R}^n$, accumulation points of a set in $\mathbb{R}^n$, and the closure of a set in $\mathbb{R}^n$.
- Students will learn how to determine the limit and continuity of a function of several variables at a point and how these concepts differ from the one dimensional setting.
- Students will learn various notions of the derivative of a function of several variables: partial derivatives and directional derivatives, and how these derivatives can be used to approximate a given function locally.
- Students will learn the theory of integration for functions of several variables: the properties of multiple integration, how to integrate over general regions, and how to interchange the order of integration (Fubini's Theorem).

The tests will serve as an assessment tool for the learning outcomes.