## Math 327H — Honors Introduction to Analysis Fall, 2019

Class meets: 1:50 -2:40 MWF in A326 Wells Hall

Professor: Office:	T. Parker D-216 Wells Hall 353-8493 parker@math.msu.edu	Office hours:	Monday: 3–4 Tuesday 2–3 Thursday 12:30– 1:30
		These may char	or by appointment. age; check class webpage.

Class Web page: sites.google.com/msu.edu/math327h

**Prerequisites:** Math 317H (Honors Linear Algebra) or equivalent, and a willingness to work hard on abstract mathematics. This is a honors course, and is a required course in the Advanced Track Mathematics Program.

**Goals:** Mathematical Analysis is a subject that subsumes and generalizes calculus. It does this my shifting the focus from calculational techniques to a broad study of approximations – approximations of numbers, to functions, and to points in abstract spaces.

The natural setting to discuss approximations is a metric space, which is simply a set in which one can measure the distance between points. Accordingly, the emphasis for first semester will be on metric spaces and the application of metric space ideas to the real numbers, to  $\mathbb{R}^n$ , and to spaces of functions. This leads to the other topics of the course: convergence of sequences, series, and sequences of functions; continuity, and differentiation and integration in  $\mathbb{R}^n$ .

## Textbooks: Principles of Analysis (third edition) by W. Rudin.

We will cover the roughly the first 6 chapters, plus parts of Chapters 7 and 8 (the remaining chapters will be covered in Math 429H.)

**Class Notes:** At times, the course will depart from the textbook, following a different route through the material or covering additional topics. Thus it is extremely important to *take detailed notes in class*.

Additional resources: There are many excellent undergraduate mathematics textbooks on Analysis. The following are listed on the Additional Resources page (private for class members).

- Real Mathematical Analysis, by C. Pugh.
- Undergraduate Analysis, by S. Lang.
- Analysis I and Analysis II by T. Tao (together, these two books comprise a 1-year course).

**Exams and grades:** There will be weekly homework assignments, several in-class quizzes, an in-class Midterm Exam, and a take-home Final Exam. Course grades will be determined by the following weighted sum:

$60 \ \%$	Homework & Quizzes	HW assigned and collected weekly.
$15 \ \%$	Midterm Exam	Friday, Oct. 18, in our classroom.
$25 \ \%$	Take-home Final Exam (covers entire course)	Wednesday, Dec. 11, 4 pm.

The exams and the homework will be based on the material covered in class. Some of this will not be in the textbook. Thus you are responsible for taking notes in class, and studying from your class notes. **Homework:** Homework assignments are the main part of the course. Homework will be assigned and collected approximately weekly. Plan on spending **2–4 hours** of homework for each class meeting.

You are encouraged to help each other on homework. However, you must write up all solutions yourself, and clearly state whom you worked (on some or all problems) at the top of each assignment. You must also cite any sources you use beyond lecture notes and the course textbooks (other textbooks, solutions found on the web, etc.)

## Important dates:

Monday, Sept. 2: Labor Day, no class.

Thurs.–Weds. Sept. 5-11 : All Math enrollment changes (late adds, drop to lower course, section changes) must be done at the Undergraduate Office, C212 Wells Hall.

Weds. Sept. 11: Last date to add, drop, or change a course and receive a 100% tuition refund.

Weds. Oct. 16: Last day to drop a course without a grade being reported.

Friday, Oct. 18: MIDTERM EXAM, in class..

Thursday & Friday, Nov. 28-29: Thanksgiving break, no classes.

Friday, Dec. 67: Last day of class.

Monday, Dec. 9: FINAL EXAM DUE. Hand in at my office D216 Wells Hall.

Attendance & Integrity: You are responsible for everything presented in class meetings. If you must miss a class, plan to get notes for that day from a classmate. Don't miss exams. As always, all students are expected to adhere to MSU's policy on academic integrity described in 'General Student Regulations' in the Spartan Life booklet vps.msu.edu/SpLife.

## Keys to Success:

(1) Take complete notes in class. This course will be based mostly on lectures (more than on the textbook).

Transcribing proofs from the board to your notes helps you understand the proofs better, teaches you the notations of the subject and the level of rigor and completeness expected, and prepares you to start the homework problems. The best way to assimilate mathematics is through your fingers to your brain.

(2) Do all homework problems; mathematics is learned by doing problems. Again, you are encouraged to work with friends on the homework problems, and to ask me for hints. Other advise:

- Begin working on the homework problems the day that they are assigned.
- Start working with others only after you have understood and worked on every problem in the assignment.
- When needed, ask me (after class, in office hours, or by email) for a hint.