

Math 461 — Metric and Topological Spaces

Fall, 2019

Class meets: 11:30 -12:20 MWF in A226 Wells Hall.

Professor: T. Parker
Office: D-216 Wells Hall 353-8493
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Office hours: Monday: 11-12
Tuesday 2-3
Thursday 12:30-1:30
or by appointment.

Class Web page: sites.google.com/view/math-461. **Bookmark this!**

Goals: The first half of this course focuses on metric and topological spaces. This subject, which commonly called “point-set topology”, is essential background for *most* areas of modern advanced mathematics (including real analysis, complex analysis, functional analysis, PDEs, differential geometry, algebraic geometry and algebraic topology).

Point-set topology is interesting, self-contained and very little background is needed to get started. By its nature, it is rigorous proof-based mathematics. Accordingly, most of the classwork (lectures, homework, exams) will be in the form of proofs.

The remainder of the course will be an introduction to algebraic topology, focusing on homology theory. This part of the course will have more pictures and examples, and be more computation-oriented.

Prerequisites: Math 320 or 327H, and a willingness to work hard on abstract mathematics.

Textbooks: *Introduction to Topology* (second edition) by T. Gamelin and R. Greene.

Topology (second edition), by K. Jánisch.

Recommended: *Basic Topology*, by M.A. Armstrong.

We will cover the first 100 pages of Gamelin and Greene, then alternate between the other two books.

Additional resources: There are many excellent textbooks on point-set topology; they vary in which topics they emphasize. Here is a list of several; most can be found on the [Additional Resources](#) page (private for class members).

- *Schaum's Outlines: General Topology*, by S. Lipschutz is a cheap, helpful book.
- *Principles of Topology* by F. Croom.
- *Introduction to Topology*, by B. Mendelson.
- *Topology* by J. Munkres.
- *Elementary Topology Problem Textbook* by O. Viro, O. Ivanov, N. Netsvetaev and V. Kharlamov. A complete course based entirely on problems. [Pdf download](#).

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

60 %	Homework	HW assigned and collected weekly.
15 %	Midterm Exam	Friday, Oct. 18 in class.
25 %	Take-home Final Exam (covers entire course)	Due Monday, Dec. 9.

The exams and the homework will be based on the material covered in class. Some of this will not be in the textbook(s). Thus you are responsible for taking notes in class, and studying from your classroom 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. 6: 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.