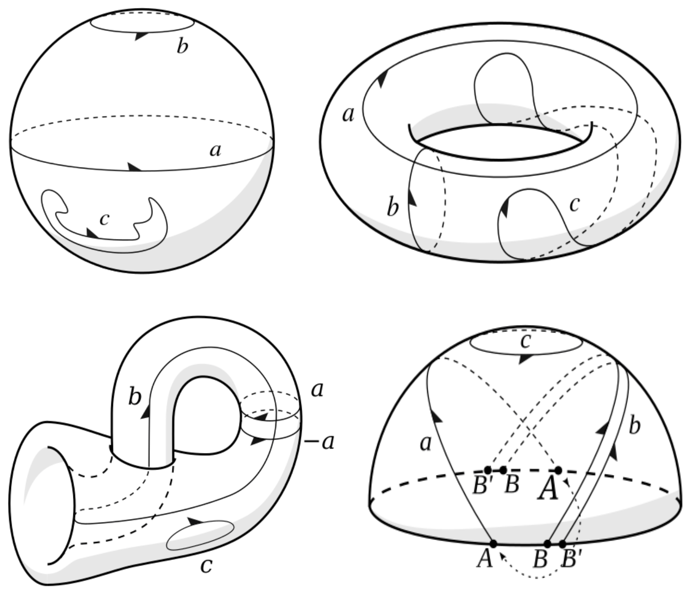
ma516: (Algebraic) Topology - f24



Class Meetings

- Fall 2024 (Aug26 → Dec13)
- MW 11:00-12:40PM
- JXJ 2319
- zoom link - passcode 700775

▼ Instructor

Daniel Rowe
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I'm an associate professor of mathematics in the Mathematics and Computer Science Department at Northern Michgan University. I've been a professor at NMU for nine years, and I am very passionate about the praxis of doing mathematics and teaching it. I grew up on a fishing camp in Northwestern Ontario, Canada.

▼ Need Math Help?

- Office Hours
- W 1-2, R 10-11, F 11-12
- JXJ 2228
- zoom link - passcode 809390
- read the relevant section(s) of our materials
- study all posted solutions
- re-watch the recorded lectures

▼ Class Structure

- hybrid-flexible, in-person and over zoom
- strive for in-person attendance if possible!
- avoid becoming reliant on zoom and recordings!
- engagement is vital to learning mathematics (or anything)

- (30%) Homework
- (25%) Midterm Exam
- (10%) Research Project
- (10%) Presentation
- (25%) Final Exam

▶ Grade Scale

▼ Learning Outcomes

This is an advanced course in topology. Topology is a fundamental mathematical subject that possesses connections with many different areas of mathematics. The instructor will cover the following topics: topological spaces, continuous functions, compactness, connectedness, the fundamental group, and homology. Additionally, the instructor may focus on topics such as: the classification of surfaces, cohomology, the Lefschetz fixed-point theorem, the Borsuk-Ulam theorem, or topics from knot theory. After completion of this course, a graduate student will have sufficient experience with, and knowledge of topology, and be capable of performing calculations and proving theorems within the discipline. For example, they will have the skill to determine if a topological space is compact or connected, describe the continuous functions on a particular topological space, compute the fundamental group, and homology groups of particular spaces, and prove the classification of two dimensional surfaces.

▼ Academic Honesty

In the spirit of academic honesty, credit for this section is due to Asher Auel, as this is an adapted form of their discussion of academic honesty in mathematics.

- Working with others on mathematics, and using electronic resources is both *highly encouraged* and *fun*. You may work with anyone (e.g. classmates, non-classmates, tutors, etc.) If this is done well, you'll learn more effectively and efficiently.

  Here's the fundamental rule:

  > **Work with anyone or anything to develop your own personal understanding of the ideas required to *solve* your homework problem, but always *write-up* the final draft by yourself and in your own words.**

- Writing up the final draft is just as important as figuring out the problems on scratch paper with your friends, using the internet, ChatGPT, etc. If you work with people, or use electronic resources on a particular homework:

  > **You must list your collaborators and electronic sources at the top of the very first page. This makes the process completely transparent and honest.**

  ### ▶ A Note About Copying Mathematics

  ### ▶ Punishments

▶ Accessibility

▼ Reading Materials

- *Topology Illustrated*; Peter Saveliev, 2016.
- my rough lecture notes (use at own risk!)

▼ Homework + Quizzes + Exams

- hw1 (due 9/8 @ 11:59PM)
- hw2
- hw3

- hw4
- hw5
- hw6

- practice_midterm
- midterm_exam

- practice_final
- final_exam

▼ project ideas (3 page paper + 15 minute presentation)

- zeros of vector fields and the hairy ball theorem
- the classification of compact orientable surfaces
- homology of real projective spaces $P^n(\mathbb{R})$
- homology of real Grassmannians *G(k,n)*
- the Lefschetz fixed-point theorem
- introduction to the braid group on *n*-strands
- introduction to rational tangles
- the Borsuk-Ulam theorem (check out this video)
- the Jones polynomial
- why do the $\mathbb{C}$-solutions of an elliptic curve form a 1-torus? - *Trent*

▶ Submitting Your Work

Schedule + Recordings

> colored text = clickable links
> late homework may be submitted anytime during the semester
> before the solutions are posted (-0%), otherwise (-50%)

wk1: aug26 → aug30

□ study this webpage and all class information
□ study the lectures
□ start working on hw1

8/26
- p. 9-15

8/28
- p. 16-23

wk2: sept2 ⟶ sept6

◻ study the lectures
◻ keep working on hw1

9/2

- Labor Day - no class

9/4

- p. 24-42

wk3: sept9 ⟶ sept13

◻ study the lectures
◻ start working on hw2

9/9

- p. 43-51

9/11

- p. 52-60

wk4: sept16 → sept20

□ study the lectures
□ keep working on hw2

- 9/16
  -
- 9/18
  -

wk5: sept23 → sept27

□ study the lectures
□ start working on hw3

- 9/23
  -
- 9/25
  -

wk6: sept30 → oct4

□ study the lectures
□ keep working on hw3

9/30
-

10/2
-

wk7: oct7 → oct11

□ study the lectures
□ start working on hw4

10/7
-

10/9
-

wk8: oct14 → oct18

□ study the lectures
□ keep working on hw4
□ study for midterm exam next wed

- 10/14
  -
- 10/16
  -

wk9: oct21 → oct25

□ study the lectures
□ midterm exam on wednesday
□ start working on hw5

- 10/21
  -
- 10/23
  -

wk10: oct28 → nov1

□ study the lectures
□ keep working on hw5

10/28
-

10/30
-

wk11: nov4 → nov8

□ study the lectures
□ finish up hw5

11/4
-

11/6
-

wk12: nov11 → nov15

□ study the lectures
□ start working on hw6

11/11
-

11/13
-

wk13: nov18 → nov22

□ study the lectures
□ keep working on hw6

11/18
-

11/20
-

wk14: dec2 → dec6

□ study the lectures
□ finish up hw6

12/2
-

12/4
-

wk15: dec9 → dec13 (FINAL EXAM WEEK)

□ final exam date: TBA
□ special office hour: TBA
□ complete any late homework for 50%

class evaluations
- please fill out the class evaluation
- I would REALLY appreciate it!
- the evaluation link is active: TBA