

MAT 444 Riemann Surfaces

2020 Fall 2

Basic Information

Instructor: Jen Paulhus paulhus@math.grinnell.edu

I do not check email between 9 PM and 7 AM on weekdays, and only infrequently on the weekends. I will make every effort to respond to emails within 24 hours.

My Office Hours: Tuesday and Thursday 2:15-3:15 PM, or by appointment.

Class Webpage: <http://paulhus.math.grinnell.edu/teaching/ma444f20.html>

Class Meetings: 1-3 PM Monday, Wednesday, Friday

WebEx/Zoom Links: See PioneerWeb (PWeb) page

Primary Text:

- *Complex Analysis*, by Bak and Newman
- *Introduction to Topological Manifolds*, by Lee
- *Riemann Surfaces and Algebraic Curves*, by Cavalieri and Miles
- Algebraic Curves and Riemann Surfaces, by Miranda (ebook access coming!)

Some Other Sources:

- *Complex Analysis with Applications*, by Asmar and Grafakos
- *Topology*, by Manetti
- *Algebraic Topology: A Primer*, by Deo
- *Riemann Surfaces*, by Donaldson

Learning Goals

Riemann surfaces are a beautiful topic in mathematics. The subject draws from various areas of math: algebra, analysis, and topology. The goal of this course is for you to learn the core introductory material on Riemann surfaces, and get a sense of how different areas of math can come together. We will have to learn some complex analysis and topology along the way.

The course will likely be set up differently than your prior math classes, and so will give you a sense of what taking graduate courses and doing more independent study in mathematics are like.

By the end of the semester you should have a good idea of what Riemann surfaces are, and how they connect to various fields in math. You should also develop skills to learn advanced mathematics independently. Progress toward these goals will be judged by the quality of your questions and responses in class and on Piazza, as well as your solutions to homework problems.

Grading

Class Discussions

Class time will generally consist of all of us together discussing and trying to figure out the concepts we will have read before each class. Participation will be **50%** of your grade.

Homework

There will be some erratic homework sets by which I mean I will assign them and give you a full week to turn them in, but they won't necessarily be "every Monday".

Homework is **30%** of your grade. Assignments will be posted on the class webpage, and must be LaTeX'd. Each homework assignment is worth the same percent of your final grade, although point totals may vary from assignment to assignment. I encourage you to work through as many of the problems in each section as you can, even if they aren't assigned.

Piazza Discussions

It's vitally important that you carefully read the daily readings before class and have a series of questions or concerns or ideas ready to go. You should post to Piazza before each class at least 2 questions you have, and then also write answers to colleagues questions when you can (or incomplete thoughts are good too!). Your participation in Piazza conversations will be **20%** of your grade.

Online Learning

Having the self motivation and discipline to work independently from home is very difficult for humans when conditions are good, let alone when the world around you is pretty much a dumpster fire. Most of us will likely be craving structure in our lives and clear goals we can work towards. I will, therefore, set explicit deadlines for each homework, and enforce those deadlines. I will also keep careful track of whether you are posting enough to Piazza. I anticipate this will be beneficial for almost all of you.

That being said, these are very strange and difficult times. If anything comes up which makes it hard for you to keep up with the work in this class (e.g., illness, travel home, or family obligations), let me know and I can work with you to make another plan.

We are all going to have to deal with unexpected interruptions, technology not working right, and just generally bad days. **It's imperative that you keep up good communication with me if you run into issues or have questions.**

Class Policies

As you'll note, the bulk of your grade in the class involves participation in discussions in class or on Piazza. I expect each of you to be respectful of each other. You have all made it to the most advanced math class on campus, and you all deserve to have your mathematical ideas listened to. Be cognizant of your own implicit biases, too. We're all

in this learning process together, and we all need to be prepared to say things we're not sure are true, and debate the veracity of each others statements.

While participation is an important part of your grade, do not think that means you have to make many frequent comments. Be sure to give classmates time to talk also. Conversely, if you are less comfortable talking in class, be willing to step outside of your comfort zone and know that your classmates and I want to hear your thoughts.

Homework Submission

I assume you all have learned to LaTeX. If not, I'm happy to give you the basics of it now. Homework assignments must be submitted in latex. There will be places in PWeb to submit homework assignments.

Homework Returns

All homework will be returned to you in a OneDrive folder.

Accommodations

Grinnell College makes reasonable accommodations for students with documented disabilities. Students need to provide documentation to the coordinator for student disability resources, Jae Hirshman. Student should then notify me within the first few days of classes so that we can discuss ways to ensure your full participation in the course and coordinate your accommodations.

Workload

The amount of time students spend on this course outside of class varies depending on many factors, but at least 15 hours a week beyond the classroom time is quite typical.

Academic Honesty

Make sure you are familiar with the [college's guidelines](#) for academic honesty.

For this class, you are allowed (and even encouraged) to work together to solve homework problems but everyone must write their own solutions. Here are some more explicit instructions regarding this: if several students are sitting around discussing how to solve a problem and in the course of the conversation one of you figures out a key piece and discusses that piece with everyone else, then you may all go off on your own and write up your own answers. Additionally, you may discuss your written solutions with anyone you have worked with to solve a particular problem.

However, it is not ok if one of you solves the problem yourself first, and then tells other people the key pieces of the problem. If you already have figured out a solution to a problem, and someone asks you how to solve the problem, tell them you already figured the problem out and they should talk to me. Giving good hints is sometimes very tough. Conversely, if you know your colleagues have figured out a problem, you should not ask them for help but instead should talk to me.

And just to be clear: **Consulting any completed solution is academically dishonest.** Never search the Internet for a solution to a problem. Reading a math solution is much easier than figuring it out yourself. It only hurts your learning to find solutions online or in another book. Talk to me or other students who have not yet solve the problem if you're stuck.

Technology

I will be regularly checking email 7:00 AM -9:00 PM Grinnell time on weekdays and a bit on the weekend. Don't hesitate to email me with questions or issues you run into.

Otherwise, there are several basic types of technology you will need for the class.

ZOOM/WEBEX

I will use one of these two programs to hold class sessions and office hours. The URL for our class meetings are posted on PWeb, and there is another link for office hours. You are not absolutely required to have audio or video on, there is a chat window you can type questions if you don't have audio, but in a discussion class like this and with such a small group of students, I highly recommend you have your audio and video on. Please wear headphones if at all possible to avoid nasty feedback.

A note on recordings. There are screen record options with these programs. I don't generally plan to use it, but there could be occasions where I start talking about something and decide it is worth recording my explanation. I will do my best to let you know the session is being recorded if that happens.

PIAZZA ON BLACKBOARD

On the class PWeb page, there is a link for "Class Discussion". This leads to a page for Piazza, a program for asking and answering questions. You will post your daily question(s) before class there. If someone has already posted one of your questions there, just click "good question", don't re-ask the same question. You can post your questions anonymously if you would prefer (although note that I will still see who you are) but in a small class like this I suggest posting with your name showing. You should also tag your question with the appropriate folder for whichever topic(s) the question is from. You are welcome (and in fact encouraged) to answer other students' questions. Piazza allows embedding of LaTeX -- put double dollar signs (\$\$) around the LaTeX.

A WEB WHITEBOARD

If you would like a shared whiteboard to work with other students (or during our office hours) check out <https://awwapp.com>.

BLACKBOARD COLLABORATE

From PWeb, you will see a link for "Collaborate". Any of you can create Collaborate sessions too from our PWeb page, so you can meet up to work together on homework there if you would like.

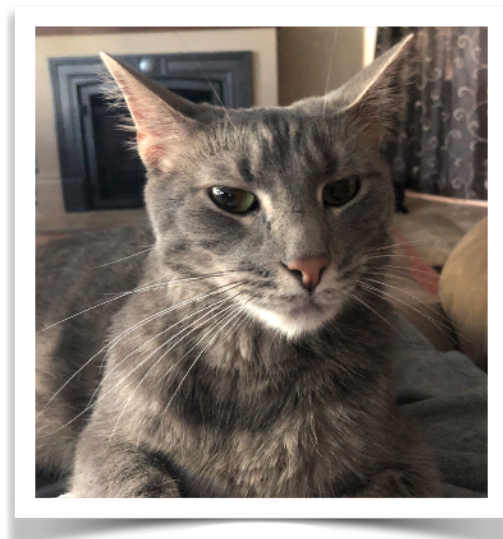
Occasional Classroom Visitors

One of the upsides of teaching from home is more time with pets. Of course, this means the pets show up in class from time to time. In order of likelihood that you will see them, here are our cats (named after mathematicians, of course).



Sylvester is the newest member of the family, and the most likely to make appearances in class. He is an energetic 2 year old, and he views my desk as *his* property. [Sylvester](#) the mathematician (1814-1897) worked on many different areas in mathematics, including some related matrix theory, number theory, and combinatorics.

Tycho(noff) is our current "middle child" and he is 3 years old. Tycho is named after both the mathematician [Tychonoff](#) (1906-1993) who made major contributions in topology, and the astronomer [Tycho Brahe](#) (1546-1601).



Maschke is our most senior cat at 12 years old. She is not thrilled to have two younger brothers, but she copes by pretending they don't exist. She is named for mathematician [Maschke](#) (1853-1908) whose most famous work is a result in a field of math called Representation Theory.