## Research Project Overview
Last updated: 2/26/24

One of the goals of this class is to provide an opportunity for students to experience mathematical research. For the first half of the semester, we are learning about various aspects of Riemann surfaces. You will each apply some aspect of that knowledge to a comprehensive and advanced research project.

**Summary:** You will each work in groups of 2-3 students on a research project. I have suggested some topics which you may choose from, or you may propose your own topic. The topic must have a substantial Riemann surface component, i.e., Riemann surfaces must be a core part of the project. There should be some open ended question(s) for you to work on. This doesn't necessarily mean the answer is known by no one in the world. Rather, it should be question(s) whose answers are not immediately known to you, nor clearly stated in the references that you are working from. In other words, your project needs to extend beyond reiterating or retelling what is in your main sources.

The culmination of the project will be a 15-20 page LaTeX paper (double spaced), and a 12-15 minute presentation to the class.

**Regular checkpoints:** There will be weekly checkpoints posted to help you scaffold the project. You need to turn in something for each of these checkpoints. At the bottom of this document is a running list of the weekly tasks which I will update weekly. Note the late penalty in the bullet points at the top of the next page.

**Grading:** The project described herein will be worth 20% of your final grade in the class. 70% of this grade will be for your written report, 30% for your presentation.

Written Report
20% Research Assignments (~5)
10% depth of work
20% quality of writing
50% accuracy/quality of mathematics
 you solved or wrote about.

Presentation
50% my grade
25% peer evaluations
10% quality of your peer comments
15% self and team reflection

**Some key points:**
- The early checkpoints will only be graded on effort.
- The paper will be graded on the quality and accuracy of the mathematics, adherence to all guidelines, and the quality of the writing.
- I will provide a rubric for the presentations later.
- Late work for later checkpoint will incur a one letter grade reduction per day late.
- You will all give feedback on each other's presentations and a small part of your final grade will be reflective of the quality of your feedback, as well as the feedback other students give you.

**Paper Details:** The final paper will be about 15-20 pages, double spaced, in LaTeX. You will need to use a style file I provide (this will make all the formats uniform). Your paper needs to include the following clearly defined sections:
- introduction
- background material and description of known results
- problem(s) or questions you attacked
- your attempts to solve the problem
- bibliography
- appendix with any code (not required, and outside the page limit numbers)

Make sure you understand the college's honesty and citation policies. We will discuss proper mathematical citations at a later date. **Due**: Thursday, May 16, 2024 by 5 PM.

**Presentation Details**: More details coming soon. The presentations will be during the last week of class.

**Miscellaneous:**
- It is possible to have a coding component to your project, but not required. The code cannot be the whole point of your project; there must be theory in your paper.
- I don't know everything about Riemann surfaces! I will help in any way I can, but all of you will be exploring topics I don't necessarily know a lot about. This is an authentic part of research.

**Audience:** You should write your paper and prepare your talk with other students in the class in mind as your audience.

**Looking forward to next couple weeks, some tasks will be to:**

I. By March 15 you will need to have 4 possible questions you could explore for the project, and you will need to have found several other references.
II. By April 5 you will need to have (in consultation with me) finalized your topic and the open questions you are working on. If you are thinking of using computation in your project, a description of how you will use that is due also.
III. By April 12 several pages of written background will be due.

**1. Due: Tuesday, March 5 at 1:00 PM** (but I won't look at it until Wednesday morning at 8 AM)

We will begin the research component of this class by finding a potential research project topic and determining your groups.

I.   Look at the topics on the *Project Descriptions* file posted on the class webpage. Determine a*t least 3 of them* which you are interested in working on and for any you are interested in, read a bit about each of the topics beyond the brief blurb. Or, if another topic not listed on the form is of interest to you, find 1-2 other students who are interested in a similar topic and put together a 2 paragraph project proposal with ideas of the topic you would like to study further. In addition, you should also still express interest in 3 of the predetermined projects.

II.  Fill in the form on Qualtrics (link in PWeb). You can rank your choices for the projects or you can propose your own project topic. In the latter case you may also request to work with a specific group of other students (no more than 3 total). If you pick one of the topics I suggest, I will assign groups based on general interest. The form also asks if there is anyone you are particularly interested in working with or anyone you would rather not work with, and I will make sure no one is assigned to a group with someone they would rather not work with.