

CALCULUS III: PROJECT 1

For the first group project, choose one out of the following projects:

- (1) **Gradient Descent:** In this project you will learn about some simple numerical methods for finding extrema of functions and you will apply it to finding the best fitting curve to a given set of data points. You will be using the programming language Sage for this project, but most of the code will be provided. There is more reading and understanding in this projects, but the actual tasks are relatively straightforward.
- (2) **Spherical Geometry:** In this project, you will investigate non-euclidean geometry. In particular, you will consider how the geometry on a sphere can be understood in a purely two-dimensional sense using a map $\Phi : \mathbb{R}^2 \rightarrow S^2$ where, S^2 is the sphere. You will prove that a shortest path on a sphere between two points consists of an arc of a great circle and you will determine what curves the great circles correspond to on the map. The computations in this project are a bit more challenging than in the other project.

Form groups of 3-4 students **from your section**. Inform your TA of your groups by **March 15th**. If you would like help finding a group to work with, contact your TA and they will assist you. All questions regarding the project should be address to your TA.

Due dates:

The project is due on March 26 on Gradescope. Only one student from each group needs to submit the project. Make sure you include every student from your group in the submission. Additionally, you will need to present your work to your TA the week the project is due. You need to be at least half way done with the project by the time of your presentation. The TA will meet with each group individually. For some groups this will be during the scheduled TA meeting times, while others will have to be scheduled individually.

Format:

There is not a strict format that your submission needs to conform to. Each project consists of a series of tasks. You need to complete each task and include sufficient detail describing your work.