MATH 340 · UNIVERSITY OF SAN FRANCISCO

Project Specification

Due Wednesday, December 9

Differential equations reach much farther than we can follow them in one semester. Your project is a chance to choose a direction that interests you and explore it in depth. You will write a paper about what you learn, and share a highlight of it in a short presentation to the class. Your topic can draw on material from anywhere in the course, and the Project Ideas page has many starting points. Each of you will do your own individual project. The project is worth 10% of your grade on the *Hold Me Accountable* scale, and 5% on the *Exam Only* scale.

What your project should do

Your project must engage seriously with differential equations. There are several good ways to do this.

- **A model.** Discuss a model in detail: how it is derived or proposed, and what its solutions tell us. You do not have to solve the equations yourself.
- **Solving equations.** Take a class of differential equations and learn how to solve them, as in a pure mathematics project.
- **Theory.** Learn more theory and explain it. Examples include nonlinear equations, Lie groups, partial differential equations, and Fourier series.
- **Numerics.** Find a differential equation of interest, learn about techniques for solving it numerically, for example in Python, and investigate it with a computer.

The paper

Write your paper for a classmate in this course: someone who knows differential equations at an undergraduate level and wants to learn more. They should be able to follow everything you write.

The paper should be at least five pages long. With figures, it will often be longer. It must be typed, in any format you like. LaTeX is the easiest way to typeset equations.

Sources are required. You do not need a particular citation style. List your sources at the end, and cite them wherever you use a fact or a model, so that a reader can look it up.

You must write the paper yourself. You may not use AI to write sentences or paragraphs. You may use AI to help you format equations in LaTeX. You may also use AI to help you write code, as long as you say so in your paper and understand the code well enough to use it yourself.

The presentation

On our presentation day, Wednesday, December 9, you will give a five-minute presentation using one to three slides. Your audience is the class. Tell us what your topic is and one cool fact you learned. You do not need to describe your whole paper. Think of the talk as a highlight reel, and an advertisement that makes your classmates want to read your paper!

Timeline

The proposal is required. The two check-ins are optional, but they are a good way to get feedback and help along the way.

- **Project Proposal** (required), due Monday, November 2: your topic, how it connects to differential equations, what you plan to do, your sources so far, and what you would like help with.
- **Check In #1** (optional), due Monday, November 23: what you have done so far, what more you propose to do, and whether that is an appropriate plan for your project.
- **Check In #2: rough draft** (optional), due Tuesday, December 1: submit a draft for feedback, and I will help you improve it.
- **Presentation day and final paper**: Wednesday, December 9. Give your presentation and turn in your paper.