Tutorial 1

Math 330 midterm exam
due at 5pm on Thursday, October 12, 2023

Instructions: Suppose that the following questions are posed by someone who took a course on partial differential equations many years ago. Write a thorough but succinct tutorial to help answer their questions. Your tutorial may take any form you like (e.g., LaTeX report, Beamer/Powerpoint presentation, video, blog/forum-style solution, annotated Mathematica notebook, carefully hand-written flowchart, etc.), so long as the medium enhances the presentation. You are encouraged to use software to aid with calculations and visualization, as long as you explain your reasoning and submit your commented code.

Questions: "I seem to remember that any function can be written as sums of sine and cosine functions. How does this work? Can sines and cosines really add up to a non-periodic function? Does it matter if my function is continuous? Differentiable? Integrable? Please give me some examples. Oh, and what does *orthogonality* have to do with this?"

Evaluation criteria:

- Did you use appropriate mathematical terminology (e.g., periodic, C^1, integrable)? Did you remind the audience of the meaning of the jargon?
- Did you provide examples and explain each step of your calculations to the audience? Did you provide intuition and justification for why, and under what conditions, your methodology works?
- Did you explain any software used well enough that an audience comfortable with Mathematica could modify your code for a related question?
- Were the answers to the questions accurate? Did you present the answers to the questions in a clear fashion? Were visualizations clearly labeled and explained?
- Is your presentation thorough (nothing important left out) and succinct (nothing extraneous put in)? Naturally, this is a matter of taste, so please seek feedback from the professor if you are unsure.

Policies: This tutorial is to be an individual project. You are expected to abide by the honor code. Either sign the Honor Pledge below and return this page, or clearly affirm the pledge in the document that you hand in.

Acceptable resources include only the following: homework and worksheet solutions, our textbook, materials linked from the course website, and your class notes. You may look up specific Mathematica and LaTeX commands online in order to perform calculations and typeset your solutions. If you have any question about this policy, please ask the professor.

This tutorial will be graded on a scale of *Excellent*, *Meets Expectations*, *Revision Needed*, or *Not Assessable*. The professor will provide an initial grade and comments after fall break. You will then have an opportunity to revise your tutorial.

St. Olaf Honor Pledge: I pledge my honor that on this examination I have neither given nor received assistance not explicitly approved by the professor and that I have seen no dishonest work.

Signed: _____

☐ I have intentionally not signed the pledge. (Check the box if appropriate.)