Reflection Activity

Submit responses to the following questions to the `Final Exam` slot on D2L by 11:59 pm on Saturday, November 30. This is much later than the due date in the syllabus; feel free to turn it in earlier. Any cogent response will earn you 5 points on the exam; you can earn the other 95 points on the exam itself.

1. (Required) We have studied four major linear PDE: the transport equation, the wave equation, the heat equation, and Laplace's equation. Compare and contrast the overall properties of solutions to these equations. You might consider such aspects as existence, uniqueness, long-time (if applicable) behavior, propagation speed (consider Example 35.1 for Laplace's equation) and formulas, as well as how changing the domains of solutions (say, from unbounded spatial domains to bounded ones, or from global time to positive time) changes the behaviors of solutions. Mention as well (but briefly) the major mathematical, analytic, or calculus techniques used to study these problems—what techniques show up in multiple places, and what techniques are more customized for particular equations? There are many ways to organize your response; a table or grid with short remarks in English words is perfectly acceptable.

2. (Required) Briefly, and informally, contrast your overall impressions of the course and the four linear PDE above with the results of Theorems 3.8 and 14.7 (both from the daily log) for linear first- and second order ODE. Remember that these results were likely the chief successes of your MATH 2306 course on ODE.

3. (Optional.) What would you like to discuss during our review in class on Monday, December 2? Please be as specific as possible and, if you can, point to numbered items in the daily log, problems from problem sets, or content in the textbook.

Exam Content

The final exam will be take-home. I will email it to you by the evening of Monday, December 2, and it will be due to the `Final exam take-home` slot on D2L by 11:59 pm on Friday, December 6. I will not accept late work or work submitted through email; you may want to screenshot with a timestamp your D2L submission. The exam will be cumulative and test material covered on Exams 1 and 2 as well as new material since Exam 2.

You will be allowed to use your notes, the daily log, the textbook, and the solutions to problem sets on D2L, but you may not communicate with anyone in the class or consult outside resources, nor may you work the exam problems at the dry erase boards in public in the math building. If I find that solutions from two people are uncannily similar, I may award half or zero credit for the problem, at my discretion. It is likely that I will assign at least one problem from the daily log that I have not previously assigned for a problem set, so being very familiar with all of the daily log problems will be helpful. While I will not put a time limit on how long you may work during the week at the exam, preparation in advance will make your work easier and more successful, and less stressful, given your other tasks that week.

Here are some topics that were not tested by the time of Exam 2 that might appear on

the final. *I may add more content to this list on Friday, November 22. I will almost surely add a topic involving Fourier series.*

1. Use the Fourier transform to find a solution candidate for a given ODE or PDE.

2. Compute the convolution of two functions.

3. Use the dominated convergence theorem to calculate the limit of an integral or explain why the DCT does not apply.

4. Differentiate under an improper integral.

5. Be familiar with the proofs of the maximum principles for the heat equation and Laplace's equation as discussed in Problem 36.10 in the daily log.

6. Be familiar with the omitted nuances of proofs and calculations for results involving Laplace's equation and harmonic functions. You should attempt all problems in the daily log from Days 35 through 40.

How to Prepare

Here are some questions for your consideration.

1. Have you completed every problem set and checked your solutions carefully?

2. Have you completed every recommended problem from the problem sets?

3. Have you completed every recommended problem from the problem sets and all of the problems from the daily log, other than those marked optional?

4. Can you do all these problems with minimal reference to your notes, my notes, the textbook, or any other source?