Reflection Activity

Submit responses to the following questions to the `Exam 1` slot on D2L by 11:59 pm on Monday, February 12. Any cogent response will earn you 5 points on the exam; you can earn the other 95 points on the exam itself.

1. (Required.) Respond to Problem 1.7.19 in the lecture notes.

2. (Required.) Submit drafts of solutions to 2 portfolio problems from the range Monday, January 8, to Friday, February 9. (Remember, this will contribute to the final score of your portfolio project.)

3. (Optional.) What have you found challenging about the course so far? How can I help you differently between now and Exam 2, and what can you do differently between now and Exam 2?

4. (Optional.) What would you like to discuss as a class during our review on Wednesday, February 14? Be as specific as you can—refer to a problem from the textbook or lecture notes or a particular example, or theorem, or page in the notes that you would like to review.

Exam Content

The exam will cover material from Days 1–13. This corresponds to the material in Sections 1.1–1.8 and 2.1–2.4 in the lecture notes. The exam will not test anything on the derivative. The exam will test your ability to do the following.

1. Calculate and simplify expressions with complex numbers, including addition, subtraction, multiplication, division, moduli, and conjugates. You should be able to find the real and imaginary parts of any given expression.

2. Sketch open or closed balls (or their complements).

3. Determine if a sequence converges or diverges and if it converges, what the limit is. (You will not have to use Definition 1.3.3 from the lecture notes; algebraic properties of sequences, the squeeze theorem, and other existing results will be sufficient.)

4. Determine if a series converges or diverges. You should memorize absolute convergence, the comparison test, and properties of geometric series. If another test (like the ratio test) would be helpful, I would remind you of it on the exam.

5. Use properties of the exponential to prove things about the exponential (Problem 28 in Section 1.6 of the textbook is a good example of what I mean by "things").

6. Use the definition of sine and cosine and properties of the exponential to prove things about sines and cosines (consider Problem 1.5.9 from the lecture notes).

7. Compute arguments of given complex numbers (Problem 1.6.5 in the lecture notes has the eight cases that you should know).

8. Prove properties of arguments (Problem Set 3 has a lot of this).

9. Compute logarithms and powers.

10. Compute nth roots, in particular nth roots of unity.

11. Explain what the statement $\lim_{z \to a} f(z) = L$ means (this is Section 2.2.1 in the lecture notes).

12. Use sequences to prove rigorously that $\lim_{z \to a} f(z)$ does not exist, likely where $f = \arg_\alpha$ for some α.

A natural question is how many problems will be on the exam. A numerical answer to this question that does not also discuss the length and difficulty of each problem (which would, more or less, require disclosing the content of each problem) will tell you very little. I expect that most students will need the full allotted time to complete an exam. There is definitely nothing wrong with you if the exam takes you all of the available time.

How to Prepare

Here are some questions for your consideration.

1. Have you completed all of the (!)- and ($\star$)-problems in the lecture notes corresponding to the material above?

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

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

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

5. Are you comfortable with defining the various technical concepts that are listed above? Remember that a complete mathematical definition is utterly unambiguous: if you give me a definition of "removable discontinuity"? I should be able to use it to decide whether any discontinuity I ever meet is in fact removable. Furthermore, for each definition, can you give a concrete example and/or nonexample? (For "limit," you should be able to explain what the definition of $\lim_{z \to a} f(z) = L$ means, give an example of f, a, and L for which it holds, and another example for which it does not.)