

Math 325, Fall 2020
Portfolio Description

This project is an opportunity for you to compile ideas from throughout the course and demonstrate how they relate to each other. This project should be typed in LaTeX and will be graded both on mathematical correctness and the quality of the writing. This project will be split into two halves. The first will focus on sequences and the second on functions. Each half can be completed and turned in separately.

In order to encourage high standards of work and to give you the opportunity to react to feedback, you will be able to revise and resubmit each half of the portfolio multiple times. In particular, each half may be revised up to THREE times. However, in order to receive credit you must satisfy ALL of the writing specifications listed below in section one.

There are three levels at which you can complete each half, and each half will be graded separately. You will notice below, in sections two and three, that there are six topics listed for each half of the assignment. A level one assignment requires that you address topics 1-4. Level two requires that you address topics 1-5, and level three requires that you address all six. If you receive credit for a level one assignment you will receive a grade of 75% on that half, level two assignments will receive a 90%, and level three assignments will receive 100%. Your total portfolio grade will be the average of your grades on each half.

All submissions must be submitted as a pdf on Canvas. Students can submit as they are ready. The first possible date to submit the sequence half is September 30th, and the first possible date to submit the functions half is October 21st. The last possible date for submission, of either half, is November 19th at 11:59 pm CST. While I will try to provide complete feedback as soon as possible I may require up to four days to give feedback on your submissions. Thus I encourage you to submit a first version well before the end of the course so that you have ample time for revisions.

1. WRITING SPECIFICATIONS

In order to earn credit your submission should be written so that it resembles a textbook, effectively integrating the mathematical work with explanation and reasoning. In particular, it should meet all of the following specifications:

- It is typeset with LaTeX using complete sentences. In particular, all mathematical notation and expressions should be part of a sentence.
- It contains more words than symbols, and symbols such as \forall , \exists , and \implies do not appear.
- The definitions, examples, claims, and proofs are written in the appropriate LaTeX environment.
- It is written at a level that is appropriate for students early in Math 325. This means you should be able to hand this assignment to a student who has only completed the first three weeks of the course and they should be able to understand the material without any follow-up questions.
- All definitions and their negations are correctly stated.
- All steps in every proof are correct.
- Every proof is complete, meaning that an early Math 325 student (see above) can trace your reasoning from beginning to end and be persuaded that your answer is correct without having to reconstruct or guess at significant portions of your thinking.
- Your writing is almost free, if not entirely free, of spelling errors.
- Your writing is almost free, if not entirely free, of basic grammatical errors such as incomplete sentences, subject-verb disagreement, and misuse of punctuation.
- Mathematical notation and terminology is used properly.

I have posted a basic LaTeX template for this assignment to help with formatting and typesetting.

2. SEQUENCES

In this section you must pick two properties of sequences that we have discussed in the course. The only restriction is that you cannot pick a property and its negation. Below are six topics for you to address. As stated above you can choose to only include topics 1-4, only topics 1-5, or all six.

- (1) A formal definition of each property.
- (2) A formal definition of the negation of each property, avoiding using the word “not” or an equivalent.
- (3) For each property give an example, with proof, of a sequence with this property.
- (4) For each property give an example, with proof, of a sequence without this property.
- (5) Determine, with proof, what combinations of the two properties are possible (is there a sequence without either property? with both? with property A but not property B? with property B but not property A?)
- (6) For each property you picked give another property which implies it (i.e. find some property C such that every sequence with property C has property A and find some property D such that every sequence with property D has property B). Formally define the new properties and prove the implications. These new properties do not need to be ones that we defined in the course. Feel free to get creative.

3. FUNCTIONS

In this section you must pick two properties of functions that we have discussed in the course. Again you cannot pick a property and its negation. Additionally, please pick at most one property from chapter 1 (the other should come from chapter 3 or 4). Below are six topics for you to address. As stated above you can choose to only include topics 1-4, only topics 1-5, or all six.

- (1) A formal definition of each property.
- (2) A formal definition of the negation of each property, avoiding using the word “not” or an equivalent.
- (3) For each property give an example, with proof, of a function with this property.
- (4) For each property give an example, with proof, of a function without this property.

- (5) Determine, with proof, what combinations of the two properties are possible (is there a function without either property? with both? with property A but not property B? with property B but not property A?)
- (6) For each property you picked give another property which implies it (i.e. find some property C such that every function with property C has property A and find some property D such that every function with property D has property B). Formally define the new properties and prove the implications. These new properties do not need to be ones that we defined in the course. Feel free to get creative.

4. POTENTIAL QUESTIONS

Below are some answers to questions you may have about this assignment. Please let me know if you have any other questions.

Question: Will any partial credit be given?

Answer: No. The only possible grades on each half are 0 (for failing to meet all of the specifications), 75% (for assignments that meet all of the specifications for topics 1-4), 90% (for assignments that meet all of the specifications for topics 1-5), and 100% (for assignments that meet all of the specifications for topics 1-6).

Question: Can I complete the two halves at different levels?

Answer: Absolutely! For instance, if you complete a level one assignment for sequences, and a level three assignment for functions then you will receive a 87.5% on the portfolio.

Question: Can I complete a level one assignment on my first submission, and later decide to expand it into a level two or three assignment?

Answer: Absolutely! You have up to four submissions for each half. You may, for instance, choose to just focus on topics 1-4 at the start, and then attempt to include topics 5 or 6 later if you have time and remaining submissions.

Question: What happens if I submit a level two assignment which meets all of the specifications for topics 1-4 but fails to meet at least one specification for topic 5?

Answer: If this is not your final submission then I will provide feedback, and you will have a chance to revise and resubmit. If it is your final submission then you will receive credit for a completed level one assignment, and thus a score of 75% on that half.