

Assignment #1

Due Wednesday, 22 January 2020, at the start of class

In our textbook,

J. Muscat, *Functional Analysis An Introduction to Metric Spaces, Hilbert Spaces, and Banach Algebras*, Springer 2014,

the exercises usually do not say explicitly what you must prove. Generally it will be clear anyway, but I will sometimes try to clarify (as below).

Please read Chapters 1, 2, 3, 4, 5, and 6 of the textbook. With a few exceptions, this material reviews metric space ideas from topology and (graduate) real analysis. When I start lecturing on Monday 20 January I will start with Chapters 1 and 7. However, during the semester I will always at least try to state definitions if they came from Chapters 2–6. Furthermore I will return to certain topics in these Chapters, especially Baire's theorem from Chapter 4 and both the Stone-Weierstrauss and Arzela-Ascoli theorems from Chapter 6.

One exercise below is identified with your initials. Please \LaTeX this problem and send both the `.tex` and `.pdf` to me at `elbueler@alaska.edu` by the same due date as above. See the course website for a \LaTeX template.

DO THE FOLLOWING EXERCISES from the textbook:

- #13 in Exercises 2.14, page 22. *Just prove the first sentence.*
- #9 in Exercises 2.20, page 24. *Just prove the last sentence.*
- #2 in Exercises 2.22, page 25.
- #2 in Exercises 3.5, page 30. *First define sequences. Then prove convergence.*
- #7 in Exercises 3.5, page 30. *Prove (a) and (b).*
- #9 in Exercises 3.12, page 35. \leftarrow **DD**
- #17 in Exercises 3.12, page 36. *Note you are assuming X is a metric space.*
- #1 in Exercises 6.9, page 69. \leftarrow **WV**
- #3 in Exercises 6.9, page 69. \leftarrow **OS**
- #9 in Exercises 6.22, page 77.