Review Guide for In-Class Midterm Exam II on *Friday, 11 November 2016*

The second Midterm Exam will cover Chapters 7, 8, 9, 10, and 11 in Sutherland, *Introduction to Metric & Topological Spaces*, 2nd edition. This material is on topological spaces, but metric space ideas may be needed in examples and counter-examples. See below for the small amount of excluded material from these Chapters that will *not* be on the Exam.

The Exam is *closed-book and closed-notes.*

The problems will be of these types: state definitions, prove propositions which follow reasonably directly from the definitions or from known facts (below), give examples with certain properties, or describe or illustrate (sketch) concepts/examples.

The questions will be straightforwardly-stated, such as "define what it means for $f : X \to Y$ to be *continuous*" or "prove that if X is Hausdorff then a subspace $A \subseteq X$ is also Hausdorff" or similar. I am aware that you will have not have a book or notes during the exam, so I will not ask you to "prove proposition 8.3" or anything like that.

Excluded material. The following material will *not* be on the exam:

- definition 9.22 of "neighborhood" (page 94)
- definition 11.8 of "regular (normal)" (page 111)

Definitions. Be able to state and use the definition:

- topological space (page 77)
- metrizable space (page 79)
- discrete and indiscrete topologies (page 79)
- coarser (page 79)
- co-finite topology (page 80)
- continuous (page 83)
- homeomorphism (page 84)
- basis (page 85)
- closed (page 89)
- closure, and point of closure (page 90)
- dense (page 90)
- interior, and interior point (page 92)
- boundary (page 93)
- subspace topology (page 97)
- inclusion map $i : A \to X$ (page 97)
- product topology, and basis for the product topology (page 101)
- projection maps $p_X : X \times Y \to X$, $p_Y : X \times Y \to Y$ (page 102)
- converges, for a sequence in a topological space (page 109)
- Hausdorff condition (page 110)

Propositions. Understand and remember these as facts. You can use these facts as needed in proving other propositions, but mention the idea if so (e.g. "...because the composition of continuous functions is continuous"). Be *able* to prove each of these, unless it is otherwise noted. On the exam I will ask you to prove a few propositions that are *short* and *important*, so I encourage you to go through this list and find the short and important propositions!

- proposition 7.2 (page 78)
- example 7.3: d-open sets form a topology (page 78) [***Proof will not be requested.***]
- proposition 8.3 (page 83)
- proposition 8.4 (page 84)
- proposition 8.6 (page 84)
- proposition 8.12 (page 86)
- proposition 9.4 (page 89)
- proposition 9.5 (page 90)
- proposition 9.10 (page 90) [***Proof will not be requested.***]
- proposition 9.11 (page 91) [***Proof will not be requested.***]
- proposition 9.12 (page 91)
- proposition 9.13 (page 92)
- proposition 9.16 (page 92)
- proposition 9.17 (page 92) [***Proof will not be requested.***]
- proposition 9.20 (page 93)
- corollary 9.21 (page 93)
- proposition 10.4 (page 97)
- corollary 10.5 (page 98)
- proposition 10.6 (page 98)
- proposition 10.8 (page 99) [***Proof will not be requested.***]
- proposition 10.9 (page 100) [***Proof will not be requested.***]
- proposition 10.10 (page 102)
- proposition 10.11 (page 102) [***Proof will not be requested.***]
- proposition 10.12 (page 102)
- proposition 10.13 (page 103)
- proposition 10.14 (page 103)
- proposition 10.15 (page 103) [***Proof will not be requested.***]
- proposition 10.17 (page 104) [***Proof will not be requested.***]
- proposition 10.20 (page 105)
- proposition 11.4 (page 110)
- proposition 11.5 (page 110)
- proposition 11.7 (page 110)

Other.

- Study and understand the commutative diagrams in Figures 10.1, 10.2, 10.3.