Review Guide for the Final Exam at *1:00–3:00 pm* on *Wednesday, 14 December 2016*

The Final Exam is worth one-and-a-half Midterm Exams, in terms of its contribution to your course grade. Like the Midterm Exams, the Final Exam is *closed-book and closed-notes*.

The Final Exam will cover both new material (Chapters 12, 13, 14, 15, and a tiny bit of 17, from Sutherland, *Introduction to Metric & Topological Spaces*, 2nd edition) and some earlier material. Roughly half of the exam will be from the recent material and half from earlier. This review sheet covers only the new material, and so:

> *You are responsible for reviewing material from earlier in the semester using the* **Review Guides** *for Midterm Exams I and II.*

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 using the same principles stated on the **Review Guides** for Midterm Exams I and II.

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

- material on "compactness and uniform continuity" (page 135)
- material on "an inverse function theorem" (pages 135–136)
- material on "Lebesgue number" for an open cover (page 145)
- material on "ϵ-nets" (page 146)
- the proof of Theorem 14.22 (page 146)
- Chapter 16 on uniform convergence (pages 173–181)
- everything in Chapter 17 beyond definition of "complete" (pages 185–200)

Definitions. Be able to state and use the definition:

- connected (page 114)
- partition (= *open* partition; page 114)
- connected subset (page 115)
- path in X from x to y (page 120)
- path-connected (page 120)
- cover, subcover, finite subcover, and open cover (page 127)
- compact (page 127)
- sequentially compact (page 142 for $\mathbb{R}$ and page 143 for a metric space)
- $X/\sim$ (if $\sim$ an equivalence relation on X; page 154)
- f respects the identifications on X (page 155)
- natural map $p : X \to X/\sim$ (page 156)
- quotient topology and quotient space (page 156)
- quotient map (page 157)
- complete (for a metric space; page 184)

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 12.3 (page 115)
- corollary 12.4 (page 115)
- theorem 12.8 (page 116) [***Proof will not be requested.***]
- theorem 12.10 (page 116) [***Proof will not be requested.***]
- proposition 12.11 (page 117) [***Proof will not be requested.***]
- corollary 12.12 (page 118)
- corollary 12.14 (page 118)
- corollary 12.15 (page 118) [***Proof will not be requested.***]
- theorem 12.18 (page 119) [***Proof will not be requested.***]
- proposition 12.19 (page 119) [***Proof will not be requested.***]
- proposition 12.23 (page 120)
- lemma 12.24 (page 121)
- proposition 12.25 (page 121)
- proposition 13.1 (page 125)
- theorem 13.9 (page 129)
- proposition 13.10 (page 129)
- corollary 13.11 (page 130)
- proposition 13.12 (page 130)
- corollary 13.13 (page 131)
- proposition 13.15 (page 131)
- corollary 13.16 (page 132)
- corollary 13.17 (page 132)
- corollary 13.18 (page 132)
- corollary 13.19 (page 132)
- proposition 13.20 (page 132)
- theorem 13.21 (page 133) [***Proof will not be requested.***]
- theorem 13.22 (page 134)
- theorem 14.10 (page 143) [***Proof will not be requested.***]
- proposition 14.11 (page 143)
- theorem 14.15 (page 144) [***Proof will not be requested.***]
- theorem 14.22 (page 146) [***Proof will not be requested.***]
- proposition 15.3 (page 155)
- proposition 15.4 (page 156)
- proposition 15.5 (page 157)
- proposition 15.8 (page 157)
- proposition 15.9 (page 158)