EXERCISES FOR

MATHEMATICS 145A — Part 0

Winter 2014

General remarks

These files contain solutions for many (most?) of the even-numbered exercises in Sutherland, *Introduction to Metric and Topological Spaces*, and the additional exercises in the files `exercises`n`.pdf` where the values of n correspond to chapters of Sutherland as follows:

$n = 01$ corresponds to Sutherland, Chapters 1 – 4.

$n = 02$ corresponds to Sutherland, Chapters 5 – 6.

$n = 03$ corresponds to Sutherland, Chapters 7 – 8.

$n = 04$ corresponds to Sutherland, Chapters 9 – 10.

$n = 05$ corresponds to Sutherland, Chapters 11 – 12.

$n = 06$ corresponds to Sutherland, Chapters 13 – 14.

Solutions for the odd-numbered exercises are given in a file from the textbook's Companion Web Site. There is a clickable link on the last page of this file.

These solutions are posted mainly for students to compare with their own efforts and to determine whether their solutions are correct or can be improved upon, but in some cases the solutions might also be useful if and when a student reaches an impasse. At some points, solutions to some of the more complicated exercises may be parts of reading assignments. However, as a general rule **the solutions should not be viewed as an excuse for not trying to work the exercises, especially those that are specifically assigned in course announcements** (*i.e.*, the `aabUpdate`$*$ files in the course directory). Problems at the level of those in the assigned exercises will appear on the course examinations, so it is important for students to be able to work out solutions on their own.

Still further exercises — some at the level of this course, but others at higher levels — and their solutions are presented in the course directory files `grad-level-hw.pdf` and `grad-evel-solns.pdf`.

Suggestions for working exercises

The directory file `polya.pdf` contains a systematic and general list of suggestions for approaching and solving mathematical problems, and the file `mathproofs.pdf` discusses the more formal aspects of mathematical proofs. Here are a few more comments:

1. Many exercises can be solved by imitating arguments in the course text or notes, so it is usually worthwhile to see if an exercise can be analyzed by modifying a previously seen argument. The following quotation from the *Poetics* of Aristotle (384–322 B.C.E.; see Section I, Part IV) seems appropriate:

The instinct of imitation is implanted in man from childhood, one difference between him and other animals being that he is the most imitative of living creatures, and through imitation learns his earliest lessons.

2. The first efforts (and in many cases subsequent efforts!) at solving exercises will not necessarily be as clear or polished as the proofs and solutions in textbooks or the files posted to the course directory. Often the first attempts to find solutions are at least somewhat messy, and they usually get better as a result of increased experience, skills, and trial and error. The following quotation due to A. S. Besicovitch (1891–1970) summarizes everything in a somewhat ironic manner:

A mathematician's reputation rests on the number of bad proofs he has given.

3. It is usually good to try anything that might work rather than not getting started with work on a problem. This advice reflects a frequently repeated quotation due to L. R.("Yogi") Berra (1925–):

When you come to a fork in the road ... Take it.

4. Although rigorous mathematical proofs must be expressed in words rather than pictures, in many cases good drawings are extremely helpful sources for insights which can suggest an approach to proving a mathematical statement. **This is particularly true for courses with substantial amounts of geometric content like Mathematics 145A.**

SOLUTIONS TO ODD – NUMBERED EXERCISES

Here is a clickable link to the file in the textbook's Companion Web Site**:**

http://fdslive.oup.com/www.oup.com/booksites/pdf/acad/9780199563081/sutherland_solutions_odd.pdf