Midterm 2: Build a slide presentation on the consequences of the Baire theorem

Due Friday, 10 April 2020, at 5pm. Send the PDF electronically.

This "take-home midterm" is very different from in-class Midterm 1!

Please start by looking at these slides which are a skeleton for a presentation on the consequences of the Baire theorem; look at both the `.tex` source and the `.pdf` result:

bueler.github.io/M617S20/mid2/slides.tex
bueler.github.io/M617S20/mid2/slides.pdf

Building slides using the `beamer` class[1] should work with whatever tools you normally use for LaTeX.

Now, here is what I would like you to do:

> *Create a slide presentation, of at most 10 slides total, which includes the statement, proof, and some of the significance of these three famous theorems:*
> - *the open mapping theorem,*
> - *the closed graph theorem, and*
> - *the Banach-Steinhaus uniform boundedness theorem.*

That is, I would like you to create a presentation on these most-important consequences of the Baire theorem, starting from the above skeleton. Please preserve the content of the title slide, but add your name as author. Preserve the content on the second slide, which states the Baire theorem itself (but do not write a proof for the Baire theorem). Then create 8 more slides which do your best job of presenting the theorems, their proofs, examples of their use, and explanations/exposition as appropriate. All three theorems are in Chapter 11 of the text,[2] and all are discussed at Wikipedia pages and in many other books on functional analysis.

What will the best slide presentation look like? First, you do *not* have to be original. Your slides should state the theorems in the simplest, most-understandable manner that is correct. (*The textbook's way of stating these theorems is* not *necessarily the best way to say them. Definitely see the Wikipedia pages too!*) Then give a clean, edited proof for each theorem. Then find applications and examples, including later in the textbook and from Wikipedia pages. Discuss examples and applications at a fairly high-level; don't get into the "weeds" after you have given a proof of each theorem. Be selective about proof details, and do not make your slides crowded! (*Do not switch to smaller fonts so you can pack more stuff on each slide!*)

Please ask me (elbueler@alaska.edu) if you have any questions. Yes, you can send me a draft and ask for feedback on it. I want you all to succeed!

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[1] See ctan.org/pkg/beamer and www.overleaf.com/learn/latex/beamer.

[2] J. Muscat, *Functional Analysis*, Springer 2014.