Math 330 Section 2 - Spring 2017 - Homework 14

Published: Friday, March 30, 2017 *Running total:* 50 *points*
Last submission: Friday, April 21, 2017

Status - Reading Assignments:

Here is the status of the reading assignments you were asked to complete by this date.

B/G (Beck/Geoghegan) Textbook:
- all of ch.1 - ch.13 (ch.7 carefully until before thm.7.17, ch.11 until cor.11.23)

MF lecture notes:
- ch.1 - ch.2, ch.4 - ch.8 (skipped the proof of prop.7.3)
- all of ch.9 except ch.9.2.2
- ch.16 (addenda to B/G text)

Other material:
- B/K lecture notes ch.1 – section 1, ch.4.1, ch.4.2
  (optional reading – good for examples, improved understanding)
- Stewart Calculus: "The Precise Definition of a Limit" (ch.1.7 in the 7th edition).

New reading assignments:

Reading assignment 1 - due Monday, April 3:
- **a.** Read carefully the remainder of MF ch.9. Note that I will not systematically lecture about vector spaces but I will use the material when it is useful in the context of metric spaces. Ch.9.2.2 (normed vector spaces) is an exception: I will talk about all of it but only in the context of ch.10.1.1 and 10.1.2.
- **b.** Read carefully MF ch.10 until before ch.10.1.5 (abstract topological spaces).

Reading assignment 2 - due Tuesday, April 4:
- **a.** Read carefully MF ch.10.1.5, 10.1.7, 10.1.8.

Reading assignment 3 - due Wednesday, April 5:
- **a.** Read carefully the remainder of MF ch.10.1.

Reading assignment 4 - due: Friday, April 7:
- **a.** Read carefully MF ch.10.2 until before ch.10.2.5 (uniform continuity).

Written assignment 1:

Prove B/G Prop.13.3: Let $k, n \in \mathbb{N}$ such that $1 \leq k < n$. Then the function

$$g_k : [n-1] \longrightarrow [n] \setminus \{k\} \quad \text{defined by} \quad g_k(j) := \begin{cases} j & \text{if } j < k \\ j+1 & \text{if } j \geq k \end{cases}$$

is bijective. **Hint:** Computing the inverse might be easiest, but be sure to **prove** that both $g_k \circ g_k^{-1} = id_{[n]\setminus\{k\}}$ and $g_k^{-1} \circ g_k = id_{[n-1]}$!

Written assignment 2:
Use anything up-to and including MF thm.7.1 and anything in B/G ch.13 to prove MF cor.7.3:

Let the set X not be countable and let $A \subseteq X$ be countable. Then its complement $A^{\complement}$ is not countable.