Math 330 Section 3 Homework 15

Update (Nov.13, 2015): **Assignment 2 was added**

Due date: Wed, November 11, 2015   *Running total:* 47 *points*
Last submission Wed, November 25, 2015

Status - Reading Assignments:

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

Textbook:
   all of ch.1 - ch.6, ch.7.1,
   all of ch.8 - ch.12

Other course material (course materials page):
   "Logic part 1", "Sets part 1", "Sets part 2", "Functions part 1", "Functions part 2"

"Lecture Notes: Math 330 - Additional Material":
   All of ch.3 (understand the material)
   all of ch.4 (understand the proofs!)
   all of ch.5 (learn all definitions and the two theorems at the end, skip the proofs
   All of ch.6 (understand the material) EXCEPT ch. 6.2.2 on normed vector spaces
   Chapter 7 until end of subchapter 7.1.1: "Measuring the distance of real functions"

New reading assignments:

New reading assignment - Due Wed, Nov.11:

B/G ch.13

"Math 330 - Additional Material" by M. Fochler ("MF"):
    – Read Ch.3.4 again, but this time do it carefully:
       this will help you to better understand B/G ch.13

Assignment 1:

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

$$(0.1) \qquad g_k : [n-1] \longrightarrow [n] \setminus \{k\} \quad \text{defined by} \quad g_k(j) := \begin{cases} j & \text{if } j < k \\ j+1 & \text{if } j \geq k \end{cases}$$

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 $g_k^{-1} \circ g_k = id_{[n-1]}$!

Assignment 2:

Prove B/G Cor.13.18: $\mathbb{Q}$ is countable. You may use all of B/G ch.13 up to thm.13.12 **plus** thm.13.19 (a countable union of countable sets is countable).
Hint: For $n \in \mathbb{N}$ let $Q_n := \{m/n : m \in \mathbb{Z} \text{ and } -n^2 \leq m \leq n^2\}$. They might come in handy!