Math 330 Section 5 - Fall 2023 - Homework 12

Published: Thursday, November 2, 2023 *Running total:* 38 *points*
Last submission: Friday, November 17, 2023

Status - Reading Assignments:

Here is the status of the reading assignments you were asked to complete before the first one of this HW.

MF lecture notes:
ch.2.1 – 2.7, ch.3, skim ch.4 (optional), ch.5 - ch.9.8, skip ch.9.9

B/G (Beck/Geoghegan) Textbook (optional, EXCEPT for ch.3 on logic):
ch.1 – 3, ch.5 – 7

B/K lecture notes:
ch.1.1 (Introduction to sets) (optional)
ch.1.2 (Introduction to Functions) but skip ch.1.2.4: Floor and Ceiling Functions (optional)

New reading assignments:

Reading assignment 1 - due Monday, November 6:

- **a.** Skip the optional MF ch.9.10 (Sequences that Enumerate Parts of $\mathbb{Q}$). The stronger students are encouraged to at least skim the contents.
- **b.** Carefully read MF ch.10.1 – 10.2. Unless you are a masochist, stay away from ch.10.3.
- **c.** If you neither have taken nor are currently taking a linear algebra course, read carefully MF ch.11.1 and ch.11.2.1 through Example 11.11 (Vector spaces of real–valued functions).

Reading assignment 2 - due Wednesday, November 8:

- Prepare for your midterm!

Reading assignment 3 - due Friday, November 10:

- **a.** If you neither have taken nor are currently taking a linear algebra course, read MF ch.11.2.1 from Definition 11.7 (linear combinations) through the end.
- **a.** Extra carefully read MF ch.11.2.2. If you don't understand this material, you will find it extremely difficult to make it through chapters 12 and 13!

Written assignment are on the next page.

Written assignment 1: Prove Proposition 7.13: Every infinite set contains a proper subset that is countably infinite.

Written assignment 2: Prove the following part of De Morgan's Law:

Let there be a universal set Ω which contains all elements of an indexed family of sets $(A_\alpha)_{\alpha \in I}$. Then

$$\Big(\bigcap_\alpha A_\alpha\Big)^{\complement} \subseteq \bigcup_\alpha A_\alpha^{\complement} .$$

Written assignment 3: Prove formula (8.30):

If X, Y, Z be arbitrary, nonempty sets and $f : X \to Y$, $g : Y \to Z$, $U \subseteq X$, and $W \subseteq Z$, then

$$(g \circ f)(U) \subseteq g\big(f(U)\big) \text{ for all } U \subseteq X .$$