Math 330 Section 3 - Fall 2017 - Homework 02

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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.

MF lecture notes:
ch.13.1 up to and including example 13.5
ch.2.2 up to and including definition 2.9. (skim)

B/K lecture notes:
No assignments yet

New reading assignments:

Reading assignment 1 - due Monday, August 28:

- **a.** Read carefully ch.2 (Preliminaries about Sets, Numbers and Functions) of the MF doc but skip ch.2.2.1 (Rings & Algebras of Sets). You will learn in depth about proofs by induction in B/G ch.2.
- **b.** Read carefully B/G ch.2.1 and 2.2.
- **c.** Suggested: Read B/K ch.1.1 (Introduction to Sets). You find there the examples for set operations that are missing from MF ch.2.1. Highly recommended!
- **d.** Read extra carefully B/G ch.2.3 (induction) up to and including cor.2.22 I will nickle–and–dime you on correctly writing down proofs that use induction and it is a **100% certainty** that such proofs will appear on both exams and the final!

Reading assignment 2 - due: Wednesday, August 30:

- **a.** Finish up B/G ch.2.3. Pay particular attention to the example proofs given there (e.g., prop.2.26.) Some advice: Read the margins! some of them like the one that explains the "ladder principle" help deepen your intuitive grasp of how proofs by induction work.
- **b.** Read B/G ch.2.4 (Well–Ordering Principle) but stop after prop.2.33.
- • You can skip the remainder: the set $S = \{k \in \mathbb{N} : k = mx + ny \text{ for some } x, y \in \mathbb{N}\}$ and $\gcd(m, n) = \min(S)$. We'll discuss that material with the Euclidian division algorithm in B/G ch.6.
- **b.** Read MF ch.16.1 and ch.16.2 (Addenda to B/G ch.1 and ch.2). MF ch.16 fills a few gaps in the B/G text.

Reading assignment 3 - due Friday, September 1:

Read carefully B/G ch.3 on logic.
Read carefully ch.4 (Functions and relations) of the MF document until before ch.4.2.2 (Definition of a function and some basic properties).

General note on written assignments: Unless expressly stated otherwise, to prove a proposition or theorem you are allowed to make use of everything in the book up to but NOT including the specific item you are asked to prove.

Written assignment 1:
Use everything up to AND including B/G prop.2.2 to prove B/G prop.2.3: $1 \in \mathbb{N}$.
Hint: This is an **indirect proof!** Part of it: Show that you cannot have $-1 \in \mathbb{N}$. **Why** will this help you?

Written assignment 2:
Use everything up to AND including prop.2.4, to prove that if $k \in \mathbb{Z}$ then $k + 1 > k$.
Hint: Use prop.2.3.

GOOD NEWS: When you do assignments from chapter 2 and later chapters you need no longer justify the rules of arithmetic given to you in ch.1. No more worry about commutativity of "$+$" and "$\cdot$" and the need for parentheses to group more than two terms. You may even use the "general laws of associativity": Given any finite sum of integers such as $(m_1 + m_2) + (n_1 + n_2)$ you may regroup the parentheses and even drop them. The same is true for products.