

Math 330 Section 2 - Spring 2017 - Homework 02

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Running total: 7 points

Updated on Jan 22, 2017 with hints to the written assignments.

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.1, ch.2.1

New reading assignments:

Reading assignment 1 - due Monday, January 23:

- a. Read ch.2.2 (Numbers) of the MF doc but skip ch.2.2.1 (Rings & Algebras of Sets). This chapter is there to remind you about some basic facts about numbers you have learned in calculus. The exception: proofs by induction. You will learn about this in a strict fashion 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 the proof of prop.2.18(i). 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: Tuesday, January 24:

- 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 do that with the Euclidian division algorithm in B/G ch.6.
- b. Read MF ch.16.1.1 (Bounded Sets in \mathbb{Z}). That’s less than 2 pages and complements B/G ch.2.4.

Reading assignment 3 - due Wednesday, January 25:

Read carefully B/G ch.3 on logic.

Reading assignment 4 - due Friday, January 27:

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 “.” 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.