Math 330 Section 5 - Spring 2022 - Homework 12

Published: Tuesday, April 5, 2022 *Running total:* 46 *points*
Last submission: Friday, April 23, 2022

Status - Reading Assignments:

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

MF lecture notes:
ch.2.1 - 2.4, ch.3, ch.4 (skim), ch.5 - 8 (skip 6.5, skim 8.2, 8.4 after Prop.8.11, ch.8.5), ch.9 skim/skip after Prop.9.44), ch.10.1-10.2, ch.11.1

B/G (Beck/Geoghegan) Textbook:
ch.1 - 7.1, ch.8-9, ch.13

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)

Other:
Stewart Calculus 9ed - ch.1.7: "The Precise Definition of a Limit". If you have a newer or older edition then you may have to search through the table of contents and/or consult the index.

New reading assignments:

Reading assignment 1 - due Monday, April 11:

- Review B/G ch.10, ch.11. You know all its material from MF ch.9.

Reading assignment 2 - due Wednesday, April 13:

- Prepare for midterm 2. Scope: MF ch.6.4 – ch.9.5

Reading assignment 3 - due Friday, April 15:

a. Carefully read ch.11.2.1 through Prop.11.6. Be sure to understand Example 11.11 and memorize its definitions!
b. Skim the remainder of ch.11.2.1 but read carefully Prop.11.9 (the last proposition)

Written assignments are on p.2.

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: Prove formula (9.14) of prop.9.11: Let X be a nonempty set and $\varphi, \psi : X \to \mathbb{R}$. Let $\emptyset \neq A \subseteq X$. Then

$$\inf\{\varphi(x) + \psi(x) : x \in A\} \geqq \inf\{\varphi(y) : y \in A\} + \inf\{\psi(z) : z \in A\}.$$

Do the proof by modifying the proof of formula (9.13). Follow that proof as closely as possible!
You are **NOT ALLOWED** to apply formula (9.13) to $-\varphi$ and $-\psi$.

Written assignment 2: Prove MF prop.9.18**(b)**: If y_n is a sequence of real numbers that is nonincreasing, i.e., $y_n \geqq y_{n+1}$ for all n, and bounded below, then $\lim\limits_{n\to\infty} y_n$ exists and coincides with $\inf\{y_n : n \in \mathbb{N}\}$.

Do the proof by modifying the proof of prop.9.18**(a)**. You are **NOT ALLOWED** to apply prop.9.18**(a)** to the sequence $x_n := -y_n$!