Math 330 Section 7 - Spring 2019 - Homework 12

Published: Thursday, March 14, 2019 *Running total:* 40 *points*
Last submission: Friday, April 5, 2019

Status - Reading Assignments:

Here is the status of the reading assignments you were asked to complete so far:

B/G (Beck/Geoghegan) Textbook:
Preface and ch.1 – ch.6, ch.7.1, ch.8 – ch.11

MF lecture notes:
ch.1 – ch.3; ch.5 – ch.7 (skim ch.6.3); ch.8.1 – 8.2; ch.9.1 through prop.9.7; ch.9.2;
ch.10.1 – ch.10.3; ch.19.7(!)

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

Other:
Stewart Calculus 7ed - 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, March 25:

a. Read carefully MF ch.10.4 and ch.10.5.

Reading assignment 2 - due: Wednesday, March 27:

a. Read carefully B/G ch.12. The material is essentially the same as that of MF ch.10.4 – ch.10.5.

Reading assignment 3 - due Friday, March 29:

a. Read carefully MF ch.10.6, but skip the material from prop.10.42 – 10.44. For thm.10.11: Only read the second proof (the one that does not make use of prop.10.42 – 10.44).
b. Highly recommended for studying ch.10.6: Study the picture between def.10.18 and prop.10.42. You should be able to draw it from memory if you understand the geometry of limsup x_n as the largest possible limit and of liminf x_n as the smallest possible limit among all convergent subsequences $(x_{n_j})_j$ of $(x_n)_n$.

Written assignment 1: Prove exercise 9.6.**a**:

Let X, Y be nonempty sets and $f : X \to Y$. If $f^{-1}\big(f(A)\big) = A$ for all $A \subseteq X$ then f is injective.

Hint: Prove the contrapositive.

Written assignment 2: Prove (10.17) of MF prop.10.12: Let X be a nonempty set and $\varphi, \psi : X \to \mathbb{R}$. Let $A \subseteq X$. Then $\inf\{\varphi(x) + \psi(x) : x \in A\} \geqq \inf\{\varphi(y) : y \in A\} + \inf\{\psi(z) : z \in A\}$.

Specific instructions for assignment 2 of this Math 330 homework: Do not follow the MF doc footnote in this proposition (applying $\inf\{\varphi(u) : u \in A\} = -\sup\{-\varphi(v) : v \in A\}$ to (10.16) but do the proof "from scratch", using the proof given for (10.16) as a template.