Math 330 Section 3 - Fall 2017 - Homework 10

Published: Thursday, October 5, 2017 *Running total:* 43 *points*
Last submission: Friday, October 20, 2017

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 – ch.6, ch.7 (skip after thm.7.17), ch.8 – 10

MF lecture notes:
ch.1; ch.2 except optional ch.2.2.1 (Rings & Algebras of Sets),
ch.4 – 6, ch.8.1 and 8.2
ch.13.1 up to and including example 13.5,
ch.16 (Addenda to B/G): the chapters corresponding to what has been assigned from B/G.

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 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, October 9:

a. Read carefully MF ch.8.3 up to but not including thm 8.3 (Characterization of limits via limsup and liminf). Skip the proofs of prop.8.13, 8.14, 8.15, cor.8.2, and thm.8.2 but make plenty of drawings to see what is going on with the following functions:
$f(x) = 1/n$; $g(x) = (-1)^n + 1/n$; $h(x) = (-1)^n(1 + 1/n)$. What are the sets $\mathscr{U}$ and $\mathscr{L}$ in each case? Do you see why $\mathscr{U} = \mathscr{U}_1 = \mathscr{U}_2 = \mathscr{U}_3$ and $\mathscr{L} = \mathscr{L}_1 = \mathscr{L}_2 = \mathscr{L}_3$

Reading assignment 2 - due: Wednesday, October 11:

a. Read carefully the end of MF ch.8.3 (including proofs) and MF ch.8.4. You may skip rem.8.6 because it references material from MF ch. 7 (cardinality).

Reading assignment 3 - due Friday, Wednesday 13:

a. Read carefully MF ch.8.4 (Sequences of Sets and Indicator functions and their liminf and limsup).

Written assignment 1:

Let $x, y \in \mathbb{R}$ such that $x < y$. Let $z := (x+y)/2$. Prove that $x < z < y$. **Hint**: Prove first that $2x < x + y < 2y$. Then use B/G prop.8.37(ii): $\left[\alpha > 0 \text{ and } \alpha u < \alpha v \;\Rightarrow\; u < v\right]$ to show that $x < z < y$.

Written assignment 2:

Close to B/G prop.8.49: Let $A \subseteq \mathbb{R}$ such that $A \neq \emptyset$. If $\inf(A)$ exists and if $\inf(A) \in A$ then $\min(A)$ exists and $\min(A) = \inf(A)$.

Written assignment 3:

Prove B/G Prop.9.7(ii) (same as MF Prop.4.1.b): The composition of two surjective functions is surjective.