Math 330 Section 2 - Fall 2018 - Homework 10

Published: Thursday, October 4, 2018 *Running total:* 40 *points*
Last submission: Friday, October 19, 2018

Status - Reading Assignments:

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

B/G (Beck/Geoghegan) Textbook:
Preface, ch.1 – ch.6, ch.7.1 (only prop.7.9 – prop.7.12), ch.8 – ch.9

MF lecture notes:
ch.1 – ch.3, ch.5, ch.6 (skip ch.6.3), ch.7, ch.8 (skip ch.8.3), ch.9, ch.10.1, ch.10.2,
ch.19.7.2 (The Addition Algorithm for Two Nonnegative Numbers (Base 10))
Any "Addenda" subchapters: those will be added to without notice.

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

New reading assignments:

Reading assignment 1 - due Monday, October 8:

- Study for the midterm!

Reading assignment 2 - due: Wednesday, October 10:

a. Read Stewart Calculus 8ed - ch.1.7: "The Precise Definition of a Limit". Look at the pictures! If you have a newer or older edition then you may have to search through the table of contents and/or consult the index.
b. Carefully read MF ch.10.3 and 10.4. Pay more attention as usual to the proofs, in particular how sequence continuity is exploited for proofs of continuity.

Reading assignment 3 - due Friday, October 13:

a. Carefully read B/G ch.10. Most of the material in ch.10.4 occurs in MF ch.10.3, and the other subchapters are very brief.
b. Cross reference B/G ch.10 and MF ch.10.1–10.4.

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 texts up to but NOT including the specific item you are asked to prove.

Written assignment 1:
Let $(G, \diamond)$ be a group, let $(H_i)_{i \in J}$ be a family of subgroups of G, and let $H := \bigcap_{i \in J} H_i$. Prove that H is a subgroup of G. Note that J is an **arbitrary** set of indices and you cannot use induction!

Hint: This exercise is to properly use the definition of an arbtrary intersection of sets. Before you start, study the proof for two groups: See prop.3.6: The intersection of two subgroups is a subgroup. You will need to refer many times to the definition of a subgroup and to prop.3.4: Subgroups are groups.

Written assignment 2: Prove (9.31) of prop.9.4: Let X, Y, Z be arbitrary, nonempty sets. Let $f : X \to Y$ and $g : Y \to Z$. Then $(g \circ f)(U) = g\big(f(U)\big)$ for all $U \subseteq X$. One point each for **a** and **b**:

a. Prove $(g \circ f)(U) \subseteq g\big(f(U)\big)$.

b. Prove $(g \circ f)(U) \supseteq g\big(f(U)\big)$.

Look at the proofs of prop.9.2 and prop.9.3 in the MF doc to see how to properly document your steps. Of course you may reference any result prior to prop. 9.4.