Math 330 Section 6 - Fall 2019 - Homework 04

Published: Thursday, September 5, 2019 *Running total:* 21 *points*
Last submission: Friday, September 20, 2019

Status - Reading Assignments:

Here is the status of the reading assignments you were asked to complete by Friday, Sept. 6.

B/G (Beck/Geoghegan) Textbook:
ch.1, ch.2.1 – 2.2, ch.3

MF lecture notes:
ch.2, ch.3, ch.5 through ch.5.2.3 (Examples of Functions)

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)

New reading assignments:

Reading assignment 1 - due Monday, September 9:

a. Read carefully MF ch.5.2.4 through ch.5.2.7. You will continually work with injectivity, surjectivity, direct images and preimages, so it is important you familiarize yourself in particular with ch.5.2.4 and 5.2.5.

Reading assignment 2 - due: Wednesday, September 11:

a. Carefully read the remainder of MF ch.5.
b. Carefully read B/G ch.5. There should be nothing you have not already encountered in MF ch.5.

Reading assignment 3 - due Friday, September 13:

a. Carefully read MF ch.6.1 and ch.6.2. Skim the contents of the optional ch.6.3
b. Carefully read B/G ch.2.3 on induction.
c. Midterm prep: Look at MF ch.20.1 (Sample problems for Induction) and try over the next week or two to work the induction problems given there closed book.

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 MF prop.3.51.**d**: Let $a, b \in R$. Then $|a \ominus b| \geqq \big||a| \ominus |b|\big|$.

Hint: Separately examine the cases $|a| \geqq |b|$ and |a| < |b|. Use the triangle inequality on $|a| = |(a \ominus b) \oplus b|$, and then on $|b| = |(b \ominus a) \oplus a|$.

Written assignment 2:
Prove the following part of MF prop.3.54: Let $(R, \oplus, \odot, P)$ be an ordered integral domain and $\emptyset \neq A \subseteq R$. If A has a maximum then it also has a supremum, and $\max(A) = \sup(A)$.

Written assignment 3: One point each for **a** and **b**:

Let $X, Y \neq \emptyset$ and $f : X \to Y$.

a. Prove that $R := \{(x, x') \in X \times X : f(x) = f(x')\}$ is an equivalence relation on X.

b. For the special case $f : \mathbb{R} \to \mathbb{R}; \quad x \to x^2$ compute the equivalence classes $[2], [0], [-2]$ for this equivalence relation.