Math 330 Section 4 - Fall 2021 - Homework 05

Published: Thursday, September 16, 2021 *Running total: 23 points*
Last submission: Friday, October 1, 2021

Status - Reading Assignments:

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

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

MF lecture notes:
ch.2-3, skim ch.4, ch.5-5.2.3

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 13:

a. Read carefully MF ch.5.2.4 - 5.2.6.

Reading assignment 2 - due: Wednesday, September 15:

a. Read carefully the remainder of MF ch.5. Warning: Ch.5.8 is quite abstract!

Reading assignment 3 - due Friday, September 17:

a. Read carefully MF ch.2.4. Pay particular attention to the proof of the triangle inequality. This is in preparation for MF ch.6.1.
b. Skim MF ch.2.5. The material should be familiar to you.
b. Read MF ch.6.1 extra carefully.
b. Read carefully MF ch.6.2.

Written assignments are on the next page.

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:
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.

Written assignment 2:
Prove formulas (5.15) and (5.16) of Proposition 5.4: Let $f : X \to Y$. Then

(5.15) $A_1 \subseteq A_2 \subseteq X \Rightarrow f(A_1) \subseteq f(A_2)$
(5.16) $B_1 \subseteq B_2 \subseteq Y \Rightarrow f^{-1}(B_1) \subseteq f^{-1}(B_2)$

One point each for a and b!!