Math 330 Section 2 - Spring 2017 - Homework 06

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Status - Reading Assignments:

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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.3, ch.5 and ch.4.1-4.4.

MF lecture notes:
a. ch.1 - ch.2, ch.4 - ch.6
b. Read carefully MF ch.16.1 (addenda to B/G ch.1) and ch.16.4 (addenda to B/G ch.4).

B/K lecture notes (optional reading – good for examples, improved understanding):
ch.1 – section 1, ch.4.1, ch.4.2

New reading assignments:

Reading assignment 1 - due Monday, February 6:
a. Finish up B/G ch.4: read carefully ch.4.5 and 4.6
b. MF doc: Read carefully everything in ch.16 (Addenda to the B/G text) you have not read so far (very little). Important is that you understand the definitions that are not in B/G like upper/lower bounds and those that are more general like the recursive definitions of $\sum x_j$ and $\prod x_j$ (not required to start at index 1). As far as the addenda to B/G ch.3 (logic) are concerned: you can get by with what is written in the B/G text. MF ch.16.3 is there to help you focus on what is particularly important B/G ch.3.
c. Re–read MF ch.4.1, and MF ch.4.2.1–4.2.5. Be sure to have understood what it means when one says that a function can be characterized as a relation from its domain to its codomain. Dig into some of the more complicated examples!

Reading assignment 2 - due: Tuesday, February 7:
Re–read extra carefully MF ch.4.2.6.

Reading assignment 3 - due Wednesday, February 8:
Re–read extra carefully MF ch.5.

Reading assignment 4 - due Friday, February 10:
Re–read extra carefully MF ch.6.

Written assignment 1:
Given are four sets A, B, C, D. prove that

a. $(A \times B) \cap (C \times D) \subseteq (A \cap C) \times (B \cap D)$,
b. $(A \times B) \cap (C \times D) \supseteq (A \cap C) \times (B \cap D)$.

You'll get one point each for **a** and **b**.

Written assignment 2:
Prove (5.4) of MF Example 5.1 (p.96): Let $a, b \in \mathbb{R}$. Then

$$\textbf{a.}\quad]a, b[\subseteq \bigcup_{n \in \mathbb{N}} [a + 1/n, b - 1/n],$$

$$\textbf{b.}\quad]a, b[\supseteq \bigcup_{n \in \mathbb{N}} [a + 1/n, b - 1/n].$$

Note for the above that $[u, v] = \emptyset$ for $u > v$ and $]u, v[= \emptyset$ for $u \geqq v$.

You'll get one point each for **a** and **b**.

Hints for assignment 2:

1. One direction is completely trivial. Which one?
2. For the other direction: You may use the following property of the real numbers (which be discussed in ch.8 of B/G) if you refer to it as "(Hwk 6 $\star$)":

   If $u, v \in \mathbb{R}$ and $u < v$ then there exist $m, n \in \mathbb{N}$ such that $u + 1/m < v$ and $u < v - 1/n$). If you have a problem visualize this, here is an example: if $u = 3.123456$ and $v = 3.123458$ then $n = m = 10^9$ or any larger natural number will certainly do the required.

   What values in the exercise play the role of u and v? That's for you to figure out.