Math 330 Section 6 - Spring 2020 - Homework 02

Published: Thursday, January 23, 2020 *Running total:* 14 *points*
Last submission: Wednesday, January 29, 2020 ***NO RESUBMISSIONS***
(two days ***before*** *the last submission date for hwk 1!)*

Status - Reading Assignments:

Here is the status of the reading assignments you were asked to complete by Friday, Jan. 31.

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

MF lecture notes:
ch.2 through ch.2.3, ch.3.1 – 3.4

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: NONE!

Written assignments: see next page

Helpful hints for the written assignments:

a. No matter what A stands for, it is never true that $A = \{A\}$. Not even if $A = \emptyset$ (the empty set): $\{A\} = \{\emptyset\}$ is a set which contains an element (exactly one): The empty set! Because $\{\emptyset\}$ is not empty it follows that $\{\emptyset\} \neq \emptyset$. By the way: It is true that $\emptyset \subseteq \{\emptyset\}$!

b. No matter what A stands for, it is never true that $A \in A$. Again, not even if $A = \emptyset$ (the empty set): The empty set contains nothing at all; in particular, it does not contain any set; in particular, it does not contain the set that has no elements, i.e., the empty set. Thus $\emptyset \notin \emptyset$.

c. **CAREFUL HERE**: It is possible to have both $a \in U$ and $\{a\} \in U$. Matter of fact, the first assignment of this homework contains such an example.

Written assignments 1-5 Partial credit will be given. You can earn as many as 10 points!

Note the following:

A. In the MF doc refer to def.2.10 for the preliminary definition of the size of a set S:
If S is finite then $|S|$ is the number of elements of S, otherwise $|S| = \infty$.

B. Refer to MF doc def.2.21 (Preliminary definition: cartesian product) for the definition of $X \times Y$.

Written assignment 1:

Let $A = \{u, w, \{w\}, \{u, w\}\}$. True or false?

a. $\{w\} \subseteq A$ **c.** $\{\{w\}\} \subseteq A$ **e.** $\{u\} \subseteq A$ **g.** $u \subseteq A$
b. $\{w\} \in A$ **d.** $\{\{w\}\} \in A$ **f.** $\{u\} \in A$ **h.** $u \in A$

Written assignment 2:

Find the size of each of the following sets:

a. $A = \{6, \{6\}, \{-6\}\}$ **c.** $C = \{5z - 3z^2 : z \in \mathbb{Z}\}$ **e.** $E = \{(-1)^k : k \in \mathbb{Z}\}$
b. $B = \{4, \{4\}, \pi, \{4\}, \{\pi\}, \{4, \pi\}\}$ **d.** $D = \{2, 3, 4, 3, 2\}$ **f.** $F = \{\sin(x) : x \in \mathbb{R}\}$

Written assignment 3:

Let $X = \{p, \{q\}\}$ and $Y = \{p, q, \{p\}, \{p, q\}\}$. True or false?

a. $\{q\} \in X \cap Y$ **c.** $\{q\} \in X \cup Y$ **e.** $\{q\} \in X \setminus Y$ **g.** $\{q\} \in X \Delta Y$
b. $p \in X \cap Y$ **d.** $p \in X \cup Y$ **f.** $p \in X \setminus Y$ **h.** $p \in X \Delta Y$

Written assignment 4:

Let $X = \{x, y, z\}$ and let $Y = \{7, 8\}$.

a. What is $X \times Y$? **c.** What is $|X \times Y|$? **e.** Is $(8, x) \in X \times Y$? **g.** Is $z \cdot 7 \in X \times Y$?
b. What is $Y \times X$? **d.** What is $|Y \times X|$? **f.** Is $(8, x) \in Y \times X$? **h.** Is $z \cdot 7 \in Y \times X$?

Written assignment 5:

Let $X = \{5\}$.

a. What is 2^X?

b. What is $2^{\left(2^X\right)}$?