Math 330 Section 6 - Fall 2019 - Homework 03

Published: Wednesday, September 4, 2019 *Running total:* 17 *points*
Last submission: Wednesday, September 11, 2019 ***NO RESUBMISSIONS***
*(two days **before** the last submission date for hwk 2!)*

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:

None - see homework 2 and 4 (once published)

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. $A = \{6, \{6\}, \{-6\}\}$
b. $B = \{4, \{4\}, \pi, \{4\}, \{\pi\}, \{4, \pi\}\}$
c. $C = \{5z - 3z^2 : z \in \mathbb{Z}\}$
d. $D = \{2, 3, 4, 3, 2\}$
e. $E = \{(-1)^k : k \in \mathbb{Z}\}$
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. $\{q\} \in X \cap Y$
b. $p \in X \cap Y$
c. $\{q\} \in X \cup Y$
d. $p \in X \cup Y$
e. $\{q\} \in X \setminus Y$
f. $p \in X \setminus Y$
g. $\{q\} \in X \Delta Y$
h. $p \in X \Delta Y$

Written assignment 4:

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

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

Written assignment 5:

Let $X = \{5\}$.

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