

Math 330 Section 7 - Spring 2019 - Homework 03

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Last submission: Wednesday, February 6, 2018

*(two days **before** the last submission date for hwk 2!)*

Running total: 16 points

NO RESUBMISSIONS

Status - Reading Assignments:

Here is the status of the reading assignments you were asked to complete so far (incl. hwk 2):

B/G (Beck/Geoghegan) Textbook:

Preface and ch.1 – ch.2

MF lecture notes:

ch.1 – ch.3

B/K lecture notes (optional but **very useful for hwk 3**):

ch.1.1 (Introduction to sets)

ch.1.2 (Introduction to Functions) but skip ch.1.2.4: Floor and Ceiling Functions

New reading assignments: NONE

Helpful hints:

- a. No matter what A stands for, it is never true that $A = \{A\}$. Not even if $A = \emptyset$ (the empty set): $\{\emptyset\} = \{\emptyset\}$ 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 example 5.4 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.2.17 (Preliminary definition: cartesian product) for the definition of $X \times Y$.

Written assignment 1:

Let $S = \{3, 5, \{3, 5\}, \{5\}\}$. True or false?

- a. $\{5\} \subseteq S$ c. $\{\{5\}\} \subseteq S$ e. $\{3\} \subseteq S$ g. $3 \subseteq S$
b. $\{5\} \in S$ d. $\{\{5\}\} \in S$ f. $\{3\} \in S$ h. $3 \in S$

Written assignment 2:

Find the cardinality of each of the following sets:

- a. $A = \{x, \{x\}, y, \{x\}, \{x, y\}\}$ c. $C = \{j, k, j, k, j\}$ e. $E = \{e^x : x \in \mathbb{R}\}$
b. $B = \{a, \{a\}, \{b\}\}$ d. $D = \{4q^2 : q \in \mathbb{Z}\}$ f. $F = \{(-1)^m : m \in \mathbb{Z}\}$

Written assignment 3:

Let $X = \{x, y, \{x\}, \{x, y\}\}$ and $Y = \{x, \{y\}\}$. True or false?

- a. $x \in X \cap Y$ c. $x \in X \cup Y$ e. $x \in X \setminus Y$ g. $x \in X \Delta Y$
b. $\{y\} \in X \cap Y$ d. $\{y\} \in X \cup Y$ f. $\{y\} \in X \setminus Y$ h. $\{y\} \in X \Delta Y$

Written assignment 4:

Let $X = \{x, y\}$ and let $Y = \{1, 2, 3\}$.

- a. What is $X \times Y$? c. What is $\text{card}(X \times Y)$? e. Is $(x, 3) \in X \times Y$? g. Is $3 \cdot x \in X \times Y$?
b. What is $Y \times X$? d. What is $\text{card}(Y \times X)$? f. Is $(x, 3) \in Y \times X$? h. Is $2 \cdot y \in Y \times X$?

Written assignment 5:

Let $X = \{8\}$.

- a. What is 2^X ?
b. What is $2^{\binom{2^X}{2}}$?