

Math 330 Section 5 - Fall 2022 - Homework 02

Published: Thursday, August 25, 2022

Last submission: Wednesday, August 31, 2022

*(Due two days **before** the last submission date for hwk 1!)*

Running total: 14 points

NO RESUBMISSIONS

New reading assignments NONE:

Written assignments:

- The material for all assignments, including the size of a set, is covered in MF ch.2.1 (Sets and Basic Set Operations) and MF ch.2.5 (Cartesian Products).
- This set is worth ten points (probably translates to more than 70 grade points)!
- Graded **ONLY ONCE**, but partial credit will be given.

Clarification:

- a. **Correct:** No matter what A stands for, it is never true that $A = \{A\}$. Not even if $A = \emptyset$ (the empty set): $\{\emptyset\}$ is a set: it is of the form $\{\dots\}$. But $\{\emptyset\}$ contains an element (exactly one): The empty set! So $\{\emptyset\} \neq \emptyset$. By the way: It is true that $\emptyset \subseteq \{\emptyset\}$!
- b. **Correct:** 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.
- c. **CAREFUL HERE:** If I told anyone of you that it is impossible to have both $a \in U$ and $\{a\} \in U$ then I made a mistake. Matter of fact, the first assignment of this homework has an example that this is possible.

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 size 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 $Y = \{3\}$.

- a. What is 2^Y ?
b. What is $2^{(2^Y)}$?

Remember that you are dealing with power sets, so the answers must be sets and NOT numbers!