

Math 330 Section 2 - Spring 2017 - Homework 03

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Last submission: Wednesday, February 1, 2017

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

Running total: 15 points

NO RESUBMISSIONS

This homework is published concurrently with homework 4

Updated on Jan 31, 2017 with clarifications about set membership.

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 hwk 3 has an example that this is possible.

Written assignments 1-4

Do the four exercises of MF ch. 2.3.2: Examples and exercises for sets. Each one is worth two points!

In the MF doc refer to example 4.4 for the preliminary definition of cardinality of a set and to def.4.1 (Cartesian Product of two sets) for the definition of Cartesian product. You find both in ch.4.1 (Cartesian products and relations) on approx. p.68. Reminder: this chapter was part of the assigned reading for Friday, September 9, 2016.

Written assignment 1 (exercise 2.1):

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

- a. $\{x\} \in X$ c. $\{\{x\}\} \in X$ e. $y \in X$ g. $\{y\} \in X$
b. $\{x\} \subseteq X$ d. $\{\{x\}\} \subseteq X$ f. $y \subseteq X$ h. $\{y\} \subseteq X$

Written assignment 2 (exercise 2.2):

Find the cardinality of each of the following sets:

- a. $A = \{x, y, \{x\}, \{x, y\}\}$ c. $C = \{u, v, v, v, u\}$ e. $E = \{\sin(k\pi/2) : k \in \mathbb{Z}\}$
b. $B = \{1, \{0\}, \{1\}\}$ d. $D = \{3z - 10 : z \in \mathbb{Z}\}$ f. $F = \{\pi x : x \in \mathbb{R}\}$

Written assignment 3 (exercise 2.3):

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: Written assignment 4 (exercise 2.4):

Let $X = \{1, 2, 3, 4\}$ and let $Y = \{x, y\}$.

- 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 $2 \cdot y \in Y \times X$?