

## Math 330 Section 3 - Fall 2017 - Homework 03

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Last submission: Wednesday, September 6, 2017

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

Running total: 15 points

**NO RESUBMISSIONS**

*Correction on 9/1/2017: Bad last submission date 9/2/2017 has been amended to 9/6/2017.*

This homework is published concurrently with homework 4

### 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 assignments 1-4

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

A. In the MF doc refer to example 4.4 for the preliminary definition of cardinality of a set  $S$ : If  $S$  is finite then  $\text{card}(S)$  is the number of elements of  $S$ , otherwise  $\text{card}(S) = \infty$ .

B. Refer to MF doc def.4.1 (Cartesian Product of two sets) for the definition of Cartesian product.

You'll find both references in ch.4.1 (Cartesian products and relations). Reminder: this chapter was part of the assigned reading for Friday, September 1, 2017.

### Written assignment 1 (exercise 2.1):

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 (exercise 2.2):

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 (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  $X = \{x, y\}$  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  $2 \cdot y \in Y \times X$ ?