

Math 330 Section 4 - Fall 2021 - Homework 02

Published: Thursday, September 2, 2021

Running total: 14 points

Last submission: Wednesday, September 15, 2021

Status - Reading Assignments:

Here is the status of the reading assignments you were asked to complete by this date:

B/G (Beck/Geoghegan) Textbook:

ch.1, ch.2.1 - 2.2

MF lecture notes:

ch.2.1 - 2.3, ch.3.1 - 3.4

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!

You will get your next reading assignments in homework 3.

Written assignments:

Partial credit will be given. You can earn as many as 10 points!
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Helpful hints:

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| <ul style="list-style-type: none">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. |
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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.2.22 (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. $\{w\} \subseteq A$
- b. $\{\{w\}\} \subseteq A$
- c. $\{u\} \subseteq A$
- d. $u \subseteq A$
- e. $\{w\} \in A$
- f. $\{\{w\}\} \in A$
- g. $\{u\} \in A$
- h. $u \in A$

Written assignment 2: Find the size of each of the following sets:

- a. $A = \{6, \{6\}, \{-6\}\}$
- b. $F = \{\sin(x) : x \in \mathbb{R}\}$
- c. $D = \{2, 3, 4, 3, 2\}$
- d. $C = \{5z - 3z^2 : z \in \mathbb{Z}\}$
- e. $B = \{4, \{4\}, \pi, \{4\}, \{\pi\}, \{4, \pi\}\}$
- f. $E = \{(-1)^k : k \in \mathbb{Z}\}$

Written assignment 3:

Let $U = \{a, \{b\}\}$ and $V = \{a, b, \{a\}, \{a, b\}\}$. **true or false?**

- a. $\{b\} \in U \cap V$
- b. $\{b\} \in U \setminus V$
- c. $a \in U \cap V$
- d. $a \in U \setminus V$
- e. $\{b\} \in U \cup V$
- f. $\{b\} \in U \Delta V$
- g. $a \in U \cup V$
- h. $a \in U \Delta V$

Written assignment 4: Let $G = \{3, 4\}$, and let $H = \{u, v, w\}$.

- a. What is $G \times H$?
- b. What is $H \times G$?
- c. What is $|G \times H|$?
- d. What is $|H \times G|$?
- e. Is $(4, u) \in G \times H$?
- f. Is $(4, u) \in H \times G$?
- g. Is $w \cdot 3 \in G \times H$?
- h. Is $w \cdot 3 \in H \times G$?

Written assignment 5: Let $X = \{4\}$.

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