

Lassonde School of Engineering

Dept. of EECS

Professor G. Tournakis

EECS 1028 M. Problem Set No1

Posted: Jan. 21, 2023

Due: Feb. 3, 2023; by **6:00pm**, in **eClass**.

Q: How do I submit?

A:

- (1) **Submission must be a SINGLE standalone file to eClass. Submission by email is not accepted.**
- (2) **Accepted File Types: PNG, JPEG, PDF, RTF, MS WORD, OPEN OFFICE, ZIP**
- (3) **Deadline is strict, electronically limited.**
- (4) **MAXIMUM file size = 10MB**



It is worth remembering (from the course outline):

The homework **must** be each individual's own work. While consultations with the instructor, tutor, and among students, are part of the learning process and are encouraged, **nevertheless**, *at the end of all this consultation* each student will have to produce an individual report rather than a *copy* (full or partial) of somebody else's report.

The concept of “late assignments” does not exist in this course, as you recall.



1. True or False and Why.
 - (a) (2 MARKS) $\{\{a\}, \{b\}\} = \{a, b\}$
 - (b) (2 MARKS) $A = \{A\}$ where A is a set.
 - (c) (2 MARKS) $\bigcup\{\{c\}, \{d\}\} = \{c, d\}$
 - (d) (2 MARKS) $\emptyset \subseteq \{1\}$
 - (e) (2 MARKS) $\emptyset \in \{1\}$
2. (3 MARKS) Is the class $\{\{x\} : \text{all atoms } x\}$ a set? **Why** yes or no exactly?
3. (5 MARKS) Is the class $\{\{x\} : \text{all sets and atoms } x\}$ a set? **Why** yes or no exactly?
4. (3 MARKS) Consider the solution below to this:

“Prove that if A is a set then so is $\{A\}$ but do NOT use an argument that involves stages *explicitly*”.

“**Proof.**” *We know (NOTEs!) that, for any sets A and B , $\{A, B\}$ is a set. But $\{A\} \subseteq \{A, B\}$, so $\{A\}$ is a set by the subclass theorem.*

What **EXACTLY** is wrong with the proof above?
5. (5 MARKS) Prove that, for any sets A and B , it is true that $A \cap (A \cup B) = A$.

Hint. You must do $\text{lhs} \subseteq \text{rhs}$ and $\text{rhs} \subseteq \text{lhs}$ as in “let $x \in \text{lhs}$. Then BLA BLA BLA, so $x \in \text{rhs}$ is true. Etc.”
6. (5 MARKS) Prove that, for any sets A and B , it is true that $A \cup (A \cap B) = A$.

Hint. You must do $\text{lhs} \subseteq \text{rhs}$ and $\text{rhs} \subseteq \text{lhs}$ as in “let $x \in \text{lhs}$. Then BLA BLA BLA so $x \in \text{rhs}$ is true. Etc.”
7. Use notation by explicitly listing **all the members** of each rhs $\{\text{??}\}$ to complete the following incomplete equalities:

(a) (2 MARKS) $2^\emptyset = \{\text{??}\}$

(b) (2 MARKS) $2^{\{a,b,c,d\}} = \{\text{??}\}$