York University
Department of Electrical Engineering and Computer Science
Lassonde School of Engineering

MATH 1028Z. MID TERM TAKE-HOME (For ALL), March 4, 2024; 13:30-14:30

Professor George Tourlakis

By putting my name and student ID on this MID TERM page, I attest to the fact that my answers included here and submitted by eClass are my own work, and that I have acted with integrity, abiding by the *Senate Policy on Academic Honesty* that the instructor discussed at the beginning of the course and *linked the full Policy to the Course Outline*.

Student NAME (Clearly):______________________________

Student NUMBER (Clearly):______________________________

DATE (Clearly):______________________________

README FIRST! **INSTRUCTIONS:**

1. Please read ALL these instructions carefully before you start writing.

2. Please answer ALL the questions.

3. Write all your answers on the pages of this book, below the questions.

4. If you need more space please use the blank back pages but if so *do indicate* that what you wrote there is part of your answer and must be marked. Otherwise it will be viewed as "scratch work".

5. This is a **TIME-LIMITED ON LINE** ***MID TERM***. You have **60 MIN** **to answer the MidTerm questions**. ABSOLUTELY last opportunity to upload is **BY 14:30 (pm)**

   Just like Assignments, here too Only a SINGLE file ***of SIZE*** $\leq$ ***10MB*** **can be uploaded per student**.

6. **eClass will reject files bigger than 10MB**.

7. If you submit photographed copy **it still must be ONE file that you submit**. Either ZIP the PNG or JPEG images **OR** import them in MS Word and submit *ONE* Word *file* with the photos attached.

8. Please write your answers by hand —see also 3. above— **as you normally do for assignments**.

9. Whichever theorems were *proved* in class or appeared in the assignments you may use without proof, **unless I am asking you to prove them in this MidTerm**. If you are not sure whether some statement has **indeed** been proved *in class*, I recommend that you prove it in order to be "safe".

Question	MAX POINTS	MARK
1	4	
2	4	
3	4	
4	8	
TOTAL	20	

Question 1. (4 MARKS) Prove that the relation $\subseteq$ —where **NO** *left/right* fields are restricting it— is a proper class.

Question 2. (4 MARKS) Suppose $\mathbb{A} \subseteq \mathbb{B}$. Prove that if $\mathbb{A}$ is a proper class, then so is $\mathbb{B}$.

Question 3. (4 MARKS) Prove that the **equality relation**, $=$, acting on **all objects of set theory**, that is on **ALL sets and atoms**, **is a proper class**.

Question 4. (a) (4 MARKS) For any classes $\mathbb{A}, \mathbb{B}$ show that $\mathbb{A} \cap (\mathbb{A} \cup \mathbb{B}) = \mathbb{A}$.

(b) (4 MARKS) For any classes $\mathbb{A}, \mathbb{B}$ show that $\mathbb{A} \cup (\mathbb{A} \cap \mathbb{B}) = \mathbb{A}$.

Caution. In each case you must show that BOTH sides of "=" have the same elements. **RECOMMENDED** to use the technique "Assume $x \in lhs$. Here is my proof for $x \in rhs$". Repeat with the other direction: "Assume $x \in rhs$. ETC., ETC."