

## Mathematics 2200H – Mathematical Reasoning

TRENT UNIVERSITY, Fall 2023

### Assignment #4

#### Sets

*Due on Friday, 6 October.\**

You should refer to the handout *The Zermelo-Fraenkel Axioms of Set Theory* for the statements of said axioms. The proofs you are asked to do should be done informally using these axioms, rather than be formal deductions in the first-order language of set theory developed in class. (That was done mainly to help illustrate how formal first-order logic works.) If you are a really serious mathochist, you may do so nevertheless, but rest assured that you will be punishing yourself . . .

1. Prove that if  $x$  is a set, then  $\{x\}$  is a set, *i.e.* there exists a set  $y$  whose sole element is  $x$ . [3]
2. If  $x$  and  $y$  are sets, then  $(x, y)$ , *i.e.*  $\{\{x\}, \{x, y\}\}$ , is a set. [3]
3. If  $A$  and  $B$  are sets, then  $A \times B$ , *i.e.*  $\{(a, b) \mid a \in A \text{ and } b \in B\}$ , is a set. [4]

---

\* Please submit your solutions via Blackboard's Assignments module, preferably as a single pdf. If submission on Blackboard fails, please submit your solutions to the instructor on paper or via email to [sbilaniuk@trentu.ca](mailto:sbilaniuk@trentu.ca) as soon as you can.