Mathematics 2200H – Mathematical Reasoning
Trent University, Fall 2022

Assignment #2
Order out of chaos?
Due on Friday, 23 September.*

Please your complete reasoning in your solution. Recall that, unless stated otherwise on a given assignment, you are permitted to work together and look things up, so long as you write up your solution by yourself and acknowledge all sources and help that you ended up using.

We discussed some basic theory, notation, and definitions in class. In this assignment you will try to define the basic concept of "ordered pair" using only unordered sets. Here is the problem:

> *Given arbitrary sets a and b, define the ordered pair (a, b) using only the symbols { and } and , (i.e. the comma), as well as, of course, a and b.*

Whatever your definition is, it is essential that it allow one to distinguish what is in the first coordinate and what is in the second, no matter what the sets a and b actually are. So, for example, $\{a, b\}$ does not work as a definition of (a, b) because sets are inherently unordered: since $\{a, b\}$ and $\{b, a\}$ have the same elements, they are the same set. In other words, you can't tell which element is supposed to come first.

1. Solve the problem. *[5]*

2. Explain why your solution actually works, as precisely and completely as you can. *[5]*

Note. For question **2**, please keep the four Cs of writing proofs (and mathematics in general) in mind. A proof (or argument, or definition) should ideally be, in order of priority:

1. Correct
2. Complete
3. Clear
4. Concise