Math 108 - Introduction to Abstract Mathematics  
Homework 7

Problems

Hand in your best work on each of the problems below. Two of the problems in this section will be selected to be graded.

1. Section 4.1 exercise 1 parts (b), (c), (d), (f), (h)
2. Section 4.2 exercise 15 all parts
3. Section 4.3 exercise 3 all parts
4. Section 4.4 exercise 2 parts (a)–(e), only give a bijection, don’t bother proving that it is a bijection.
5. Prove that the composition of two injections is an injection, and also prove that the composition of two surjections is a surjection. Write up your solution to this problem in LaTeX. This time, a sample file will not be provided.
   Two LaTeX tips for this problem: ‘\to’ draws the right arrow for a function, as in ‘$f:A\to B$’. Also, ‘\circ’ is the command for a composition, as in ‘$g\circ f$’.
6. Write up a proof of some fact pertaining to your project and hand it in for this problem. It cannot be the same thing you wrote up last week.

Extra practice problems

1. Section 4.1 exercise 4
2. Section 4.2 exercise 2 (beware of their definition of composition; some of these problems are not well-defined!)
3. Section 4.3 exercises 4, 10
4. Section 4.4 exercises 1, 3

Bonus Problem

1. Prove that a function $f : A \to B$ is surjective if and only if for all sets $C$ and for all functions $g : B \to C$ and $h : B \to C$,
   \[ (g \circ f = h \circ f) \Rightarrow (g = h). \]