

Review Sheet for Exam 1

Format: the exam will most likely go as follows

- A page of short answer questions like “State the well ordering principle” or “State the definition of an injective function.”
- A part that begins with instructions something like “Following are 8 assertions, 5 of which are false.” Identify the false ones and give examples showing that they are false.
- Problems asking you to prove some assertion or other. I expect there to be about three of these.

I don’t promise to keep to exactly this structure (for instance, I could ask you compute the base 5 decimal expansion of some number or other—that wouldn’t fall into any of the above categories.) However, I won’t deviate much from it.

Things to know:

definitions and statements. function; injective, surjective, and bijective functions; well-ordering principle; complement of a set; cardinality; union, intersection and Cartesian product of two sets; prime number; ‘a divides b’; prime number; domain, range, and image of a function; base q decimal expansion of n ; increasing, decreasing, and monotone function; the division algorithm.

proofs of specific theorems. $\sqrt{2}$ is irrational; there are infinitely many prime numbers.

techniques of proof. proof by (strong) induction; proof by contradiction; proof by exhaustion; proving two sets are equal; Proving a function is injective, surjective, or bijective; Proving a function is increasing or decreasing.

logic. Negation of a statement; contrapositive of a statement; quantifier symbols like ‘for every’ and ‘there exists’.

I’m sure I’ve forgotten something in all this. However, I think I’ve got most things down.

Advice for studying: Beyond remembering the specific things I mentioned above, make sure you review the homework problems. Compare your solutions with my solutions. Solve old problems from scratch. Solve some problems that look similar to the ones I assigned. Etc. For one thing, some of the test will be taken nearly verbatim from the homework. For another, in my opinion, solving problems is the only way to really learn and understand math.