

## Review Sheet for Exam 2

**Review Session:** in place of office hours on Tuesday April 17, there will be a review session in Hayes-Healy 127 from 5:30-7 PM. The usual Monday review session on 4/15 will (contrary to the first version of this review sheet) be held as scheduled.

**Format:** similar to the first exam.

**Content:** The exam covers everything that came after modular arithmetic up to (but not including)  $b$ -ary expansions of real numbers. In terms of general topics, induction (including the binomial theorem), rational numbers, functions, cardinality, real numbers and convergent sequences are all fair game.

### Things to know:

**definitions and statements.** Binomial theorem, binomial coefficient; rational number (including the relevant equivalence relation); density property; informal definition of a function; domain, codomain, range, graph of a function; injective, surjective, bijective function; upper bound, least upper bound, completeness axiom, archimedean property; triangle inequality, sequence, **convergent sequence**; bounded sequence, increasing/decreasing/monotone sequence; monotone convergence theorem, squeeze theorem;

**proofs of specific theorems.** Know how to prove that  $\sqrt{2}$  is irrational, the archimedean property, and that  $\#\mathbf{N} \neq \#\mathbf{R}$ .

**proof skills and techniques.** Proof by induction; proving a function is injective/surjective; proving two sets have the same cardinality; proving that a sequence converges using the definition of convergence; proving that a sequence converges (or diverges) using results from section 11 in the notes. Don't forget things learned from the first half of the term like proof by contradiction, proving two sets are equal, using definitions, etc (see review sheet for exam 1).

**computational skills.** Not so much to cover here this time—finding binomial coefficients, identifying least upper bounds and greatest lower bounds, and working with inequalities are the things that come to mind.

**standard disclaimer.** I'm sure I've forgotten something in all this. However, I think I've got most things down.

**Advice for studying:** Similar to last exam. If there's a particular topic you feel uneasy about, I might be persuaded to think of a couple of additional problems for you to work on.