

Math 29: Final Review

June 1st, 2022

1 Review

You should be prepared to know facts about and how to apply the following topics for **BOTH** the in-person portion and the take-home portion.

- Injective, surjective, and bijective functions
- Partial functions (i.e. **not necessarily total**, not “not total”) vs total functions
- Coding finite objects as natural numbers
- What the Church-Turing thesis says and how to apply it in practice
- Properties of the universal machine and what it means to be uniformly computable
- That the total computable functions are not uniformly computable
- The s-m-n theorem
- The recursion theorem (and with parameters)
- Using the recursion theorem with the s-m-n theorem to build functions
- Noncomputable functions and sets
- Rice’s Theorem
- The halting problem (K and H)
- The halting problem with stages
- Productive sets and productive functions
- Creative sets
- Immune sets
- Simple sets

- Effectively simple sets
- 1-reducibility, m -reducibility, and computable isomorphism
- Completeness, and the distinction between complete c.e. sets and 1-complete sets
- Index set theorem and some applications, i.e. $Nem \equiv_T \emptyset'$, $Tot \equiv_T \emptyset''$, etc.
- Oracle computation/the finite use principle
- Turing reducibility
- The Friedberg-Muchnik theorem
- Relativization
- The jump and its properties
- Limit computable functions and the limit lemma
- Arslanov's Completeness Criterion
- Low and high sets
- Sacks' Splitting Theorem
- General facts about the c.e. degrees and degrees below \emptyset' which we proved throughout the course.