

Math 29: Midterm Review

April 27th, 2022

1 Review

You should be prepared to know facts about and how to apply the following topics for **BOTH** the in-person portion on April 28th and the take-home portion due May 4th.

- Injective, surjective, and bijective functions
- Partial functions (i.e. **not necessarily total**, not “not total”) vs total functions
- Coding finite objects as natural numbers
- How to interpret the behavior of a register machine
- How to interpret the behavior of a Turing machine
- 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

Additionally, for the take-home portion **ONLY**, you should be prepared to answer questions on the following topics.

- Productive sets and productive functions
- Creative sets
- Immune sets
- Simple sets