Math 29: Homework 2

Due Wednesday, April 12

The parenthetical descriptions of the problems are supposed to be summaries that may be useful as reminders to you during later study. Please read—and do what is asked in—the actual statement of the problems.

In the two questions concerning Turing machines, olease include an annotation of the Turing machine in your solution, or otherwise describe how it does what it does.

1. (recursive cases are recursive) Exercise 2.2.21. *(Some of you wanted to use a definition by cases in your homework—though you correctly resisted! This indicates that you sometimes can.)*

2. (URM-computable is closed under minimalization) Suppose that the URM program P_g computes a function $g(\vec{n}, m)$, where $\vec{n} = (n_1, \ldots, n_k)$. Describe a URM program that computes the function

$$f(\vec{n}, m) = \mu m[g(\vec{n}, m) = 0].$$

3. (recursive difference is Turing computable) Exercise 2.4.11.

4. (a more complicated Turing machine) Exercise 2.4.15, first part only. (The "Say which function..." part.)

5. (a countable set) Exercise 3.1.18

6. (uncountability) Exercise 3.1.20