University of Nevada, Las Vegas Computer Science 456/656 Spring 2015

Assignment 8: Due March 24, 2015

Name:_____

You are permitted to work in groups, get help from others, read books, and use the internet. But the handwriting on this document must be your own. You may attach extra sheets, using a stapler. Be sure to write your name on each extra sheet, just in case.

1. Work Exercise 3.1 on page 187 of the third edition of Sipser. (Exercise 3.1 on page 159 of the second edition, or exercise 3.1 on page 147 of the first edition.)

2. Work Exercise 3.2 on page 187 of the third edition. (Exercise 3.2 on page 159 of the second edition. or exercise 3.2 on page 147 of the first edition.)

3. Work Exercise 3.8(b) on page 188 of the third edition. (Exercise 3.8(b) on page 160 of the second edition. or exercise 3.8(b) on page 148 of the first edition.)

4. A set which has an enumeration is called *enumerable*, or *countable*. A set which has no enumeration is called *uncountable*. (Note that existence of an enumeration does not imply existence of a recursive enumeration.)

   True or False. Explain your answers.

   (a) _____Every subset of countable set is countable.

   (b) _____Every subset of a recursively enumerable set is recursively enumerable.

   (c) _____Every language over $\Sigma = \{0, 1\}$ is countable.

5. Let $\mathbb{R}$ be the set of real numbers. The best known proof that $\mathbb{R}$ is uncountable is Cantor's diagonalization proof, which you can find in many places.

   Let Σ be any alphabet. (You may assume that $\Sigma = \{0, 1\}$, if that helps.) Use diagonalization to prove that there are uncountably many languages over Σ.