

CS4104 Fall 2010 Homework Assignment 13  
Due at 11:00pm on Tuesday, December 7  
50 Points

**Pledge: I (we) have not received unauthorized aid on this assignment. I (we) understand the answers that I (we) have submitted. The answers submitted have not been directly copied from another source, but instead are written in my (our) own words.**

**1.** [15 points]

Prove that the set of real numbers is uncountable. Use a proof similar to the proof in Section 17.3.1 that the set of integer functions is uncountable.

**2.** [20 points]

Prove, using a reduction argument such as given in Section 17.3.2, that the problem of determining if two arbitrary programs halt on exactly the same inputs is unsolvable.

**3.** [15 points]

Consider a program named COMP that takes two strings as input. It returns TRUE if the strings are the same. It returns FALSE if the strings are different. Why doesn't the argument that we used to prove that a program to solve the halting problem does not exist work to prove that COMP does not exist?