Assignment 6

CSI 4336

Due October 16, 2018

Submitting your assignment

All written portions of the assignment should be prepared in LaTeX.

Submit this assignment by the due date in two ways: by email (before class) and printed (at the beginning of class). Don't put any code in the printed copy. Proofread your document for style before submitting it.

Send the email to `hamerly@cs.baylor.edu` with the subject "CSI 4336 assignment X" (where X is the assignment number). The email should have one attachment (plain text, .zip, or .tar.gz format) containing:

- the .tex document you wrote named "lastname.tex" (where 'lastname' is your last name),
- a compiled .pdf from the .tex document named "lastname.pdf" (where 'lastname' is your last name),
- any additional files used in your LaTeX document, named "lastname_fig1.pdf" (or similar), and
- all source code used for any programs.

Textbook exercises (10 points each, 40 points total)

1. Do problem 5.9 from your textbook. Do not use Rice's theorem in your proof; instead, use a reduction.
2. Do problem 6.23 from your textbook (note: this is 6.22 in the second edition). Hint: you could use a reduction for this problem (as usual), but it is much easier to prove if you consider what you would be able to do if $K(x)$ was computable, along with the idea that some strings of every length are incompressible (Theorem 6.29).
3. Do problem 6.21 from your textbook (note: this is 6.20 in the second edition). However, modify the problem – instead of using an oracle for A_{TM}, use an oracle for $HALT_{TM}$ (this makes the problem easier).
4. Consider the languages $HALT_{TM}$ (from Theorem 5.1) and E_{TM} (from Theorem 5.2). Prove the following statement:

$$E_{TM} \leq_T HALT_{TM}$$