

CS 3800, Fall 2017 (Clinger's section)

Homework 6 (40 points)

Assigned: Wednesday, 18 October 2017

Due: Wednesday, 25 October 2017

1. [8 pts] Use the textbook's mathematical definition of a Turing machine to answer the following true/false questions:
 - (a) Can a Turing machine ever write the blank symbol on its tape?
 - (b) Can the tape alphabet Γ be the same as the input alphabet Σ ?
 - (c) Can a Turing machine's head *ever* be in the same location in two consecutive configurations?
 - (d) Can a Turing machine have only one state?
2. [10 pts] Explain why the following idea does not describe an algorithm that solves Hilbert's tenth problem:

Given an input that encodes a Diophantine equation E over variables x_1, \dots, x_k , enumerate all possible combinations of integer values for x_1, \dots, x_k , evaluating E for each combination of values. If any combination satisfies the equation E , accept. Otherwise reject.
3. [15 pts] Show that the collection of Turing-recognizable languages is closed under the following operations:
 - (a) union
 - (b) concatenation
 - (c) star
 - (d) intersection
4. [7 pts] Show that the collection of Turing-recognizable languages is not closed under complementation.