## 15 Time Complexity Classes

## Computer Science 311: Computational Structures Spring 2016

**Exercise 1** Consider the following two-tape Turing machine that also decides  $\{0^n 1^n \mid n \ge 0\}$ : M = "On input w:

- 1. If the input is not of the form  $0^*1^*$ , REJECT
- 2. For each zero in the input, write a one to tape 2
- 3. Return tape 2's head to the left
- 4. For each one in the input, ensure that we see a one on tape 2
  - If either tape sees a blank before the other, REJECT
  - If both tapes read blanks at the same time, ACCEPT"

Find the time complexity of M.

**Exercise 2** Let SUBSETSUM = { $\langle S, v \rangle \mid S$  is a set of integers with a subset that sums to v}. Construct a poly-time deterministic verifier to show that SUBSETSUM  $\in NP$ .