

15-453 Homework # 4

1. Write-Once TMs (40 Points) Define a *write-once Turing machine* as a single-tape TM that can alter each tape square at most once (including the input portion of the tape). Prove that this variant Turing machine model is equivalent to the ordinary Turing machine model. (Hint: As a first step consider the case whereby the Turing machine may alter each tape square at most twice. Use lots of tape.)
2. Doubly Infinite Tapes (40 Points) A *Turing machine with doubly infinite tape* is similar to an ordinary Turing machine except that its tape is infinite to the left as well as to the right. The tape is initially filled with blanks except for the portion that contains the input. Computation is defined as usual except that the head never encounters an end to the tape as it moves leftward. Show that this type of Turing machine recognizes the class of Turing-recognizable languages.