The Theory of Computation

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Solution Manual
Chapter 6, Problem 6.5

The proof is deceptively simple: the machine can simply replace its input string by the one string of the same length that induces the same behavior. (Typically, that string is thought of as a string of 1s.) Since we use off-line Turing machines for space bounds, however, the machine cannot actually alter the input tape, which is read-only; thus what it does is to write onto the scratch tape the desired string, then proceed as the original machine did, except that the input is always read from the scratch tape instead of the input tape. Since we thus immediately use at least n tape squares on the scratch tape for an input of size n, this technique can only be used for constructing space functions that are at least as large as n everywhere.