1. [15 pts] Is $3^n \in O(2^n)$? Prove your answer. (Problem 14.4 on Page 462)

2. Let $L$ be the language over \{a, b\} that contains a string $u$ if it satisfies one of the following conditions (Problem 14.11 on Page 464):

   (i) $u = a^i b^i$ and length($u$) $\leq$ 100, or
   (ii) length($u$) $>$ 100.

   (a) [20 pts] Design a standard TM $M$ that accepts $L$.
   (b) [10 pts] Give the function $t_{cM}$.
   (c) [5 pts] What is the best polynomial rate of growth that describes $t_{cM}$?