Assignment4

1. [2 pts] (Multiple choice) Assume there is a decider *M*, and a language L(M) recognized by *M*. Which of the following statements is/are **TRUE**?
   A. *M* must be a Turing Machine
   B. L(M) must be a finite set
   C. L(M) must be Turing-decidable
   D. L(M) must be Turing-recognizable
   E. *M* will halt on all inputs
2. [2 pts] (Multiple choice) If a language *A* is Turing-decidable, then the subset of *A* can be _____.
   A. Turing-decidable
   B. Turing-undecidable
   C. Turing-recognizable
   D. Turing-unrecognizable
3. [2 pts] (True or False) A language *L* is Turing-recognizable if and only if both *L* and its complement L^C are Turing-decidable.
4. [1 pts] (True or False) If $f(n) = O(g(n))$ and $g(n) = O(h(n))$, then $f(n) = O(h(n))$.
5. [1 pts] (True or False) For an arbitrary size input, an algorithm with O(1) time complexity will definitely solve the problem faster than an algorithm with O(n) time complexity.
6. [2 pts] Give the Big-O estimates for the following functions:
   1) $f(n) = 2n(n^2 + 1) + 10nlogn$
   2) $f(n) = 1^4 + 2^4 + 3^4 + \cdots + n^4$