Examination 2
CS 336

1. The important issue is the logic you used to arrive at your answer.
2. Use extra paper to determine your solutions then neatly transcribe them onto these sheets.
3. Do not submit the scratch sheets. However, all of the logic necessary to obtain the solution should be on these sheets.
4. Comment on all logical flaws and omissions and enclose the comments in boxes

[20] Using only Definition 2', show that the set of positive odd integers (i.e., 1, 3, 5, …) is infinite.

2. [20] Suppose the sets $A$ is uncountably infinite and $B$ is nonempty, prove that the set $A \times B$ is uncountably infinite.

3. [20] Show that the set $P$ of all computer programs in language X is a countable set. For this, assume
   a. that the set $A$ of characters that can be used for programs in X is finite,
   b. that all programs consist of finitely long strings of characters from $A$, and
   c. that the set of programs is a subset of these finitely long strings that obey some collection of syntax rules.

4. [20] Using only Definition 1, prove that if $n^3 = O(n^5)$

5. [20] Suppose $f : \mathbb{N} \rightarrow \mathbb{R}$ is the polynomial $f(n) = \sum_{i=0}^{k} a_i n^i$. Prove that $f = O(n^k)$.

6. [20] Using the Definition 2, prove that $n^3 \neq o(10n^3)$. 