Name _____

Examination 2

CS 336

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Total	

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

1. **[20]** Using only Definition 2', show that the set of negative integers is infinite.

2. **[20]** Suppose the set A is uncountably infinite, the set B is countably infinite, and the set C is finite. Let $D = A \cup B \cup C$. Is D finite, countably infinite, or uncountably infinite? Prove your claim.

3. **[20]** Suppose the set A is non-empty and the set B is uncountably infinite. Prove that the cartesian product $A \times B$ is uncountably infinite.

4. **[20]** Using only Definition 1, prove that $3n^4 = \mathrm{O}(n^{4.5})$.

5. **[20]** Using only Definition 2, prove that $5^n \neq o(2 \cdot 4^n)$.

6. **[20]** Suppose $f = \mathrm{O}(g)$ and $g = \mathrm{O}(h)$, prove or disprove (with a simple counter-example) that $f = \mathrm{O}(h)$.