CMPS 2200 Assignment 1

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In this assignment, you will learn more about asymptotic notation, parallelism, functional languages, and algorithmic cost models. As in the recitation, some of your answer will go here and some will go in `main.py`. You are welcome to edit this `assignment-01.md` file directly, or print and fill in by hand. If you do the latter, please scan to a file `assignment-01.pdf` and push to your github repository.

1. (2 pts ea) **Asymptotic notation**

- 1a. Is $2^{n+1} \in O(2^n)$? Why or why not?

  Yes

  f(n) is O(g(n))?

  $2^{n+1} = 2 \cdot 2^n \leq c \cdot 2^n$ and $c \geq 2$

  c = a constant 2^{n+1} is an element of $O(2^n)$

- 1b. Is $2^{2^n} \in O(2^n)$? Why or why not?

  No

  c = a constant

  f(n) is O(g(n))

  2^{2^n} is NOT an element of $O(2^n)$

  $2^{2^n} = 2^n \cdot 2^n$

  $2^x \cdot 2^n = c \cdot 2^n$

  $2^n = c$ which is false because n would have to be a constant in this scenario

- 1c. Is $n^{1.01} \in O(\log^2 n)$?

  c = constant

  ND It approaches to ∞ which is Ω not O

  $1.01 n^{100} \geq 2 \log n \cdot c$

  L'Hopital Rule states it is approaching infinity

- 1d. Is $n^{1.01} \in \Omega(\log^2 n)$?

  Yes It appears to ∞ which is Ω

  $1.01 n^{.01} \geq 2 \log n \cdot c$

  L'Hopital Rule stats it is approaching infinity

- 1e. Is $\sqrt{n} \in O((\log n)^3)$?

  Yes

  $\frac{1}{2\sqrt{n}} \cdot 3 \log^2 n \cdot c$

  Both of these cross, and the derivative of $3 \log^2 n \cdot c$ is greater so when multiplied by a constant it is greater. As the limit approaches infinity it is 0 which is why it is Big-O.

- 1f. Is $\sqrt{n} \in \Omega((\log n)^3)$?

  No

  $\frac{1}{2\sqrt{n}} \cdot 3 \log^2 n \cdot c$

  Both cross, and the derivative of $3 \log^2 n \cdot c$ is greater so it is greater when