CS 240: Data Structures and Data Management

Tutorial 01: January 16

This tutorial focuses on proofs by first principles. The breakdown is 1 hard [H], 1 medium [M], and 2 easy [E] questions.

1. [E] Big-Omega

Prove from first principles that $\frac{5}{3}n^6 - 45n^2 + 5n + 133 \in \Omega(n^6)$.

- 2. [E] Little-oProve from first principles that $7\sqrt{n^3} \in o(4^{\log n})$.
- 3. [M] Fraction between Big-O and Little-Omega:

Prove or disprove the following claim. If $f(n) \in O(h_1(n))$ and $g(n) \in \omega(h_2(n))$, then $\frac{f(n)}{g(n)} \in o\left(\frac{h_1(n)}{h_2(n)}\right)$, assuming $f(n), g(n), h_1(n)$ are all positive $\forall n \ge 0$. You should prove the statement from first principles or provide a counter example.

4. [H] Little-Omega:

Prove from first principles that $n \in \omega\left(2^{\sqrt{\log n}}\right)$.