CSE 674 Advanced Data Structures

Background Review

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Contents

- “Summations”, “Products”, “floors” and “ceilings”
- Sets etc.
- Counting
- Matrix etc.
- Reference: Appendix from Cormen’s Text; Your course notes from discrete mathematics, calculus and linear algebra classes may help

Summations and other notations

Explain the meaning of the following expressions:

- $\sum_{i=1}^{n} a_i$
- $\sum_{i=1}^{\infty} a_i$
- $\prod_{i=1}^{n} a_i$
- $\lfloor x \rfloor$
- $\lceil y \rceil$

Useful Identities

- $\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$
- $\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$
- $\sum_{k=1}^{n} k^3 = \frac{n^2(n+1)^2}{4}$
- $\sum_{k=0}^{\infty} x^k = \frac{1}{1-x}$ for any $|x| < 1$
- $\sum_{k=0}^{\infty} kx^k = \frac{x}{(1-x)^2}$ for any $|x| < 1$
- More identities are listed in Appendix A

Principle of Mathematical Induction

Questions:

1. Outline what it is
2. Identify the assumption(s)
3. Identify the conclusion(s)
4. Why you think it is correct ? Explain
5. Give examples on how you apply this principle

Handling Limits

Given a sequence numbers

$$a_1, a_2, \ldots, a_k, \ldots$$

Question:

1. Does the limit $\lim_{k=1}^{\infty} a_k$ exist ?
2. Does the limit $\lim_{n=1}^{\infty} \sum_{i=1}^{n} a_k$ exist ?

Discrete Mathematics

List the *definitions* and *basic facts* for

- Sets
- Relations
- Functions

Explain the notation(s) you use.

How about Trees and Graphs ?

Big-O notation

Question:

In your own words, explain what is Big-O notation (you probably have learned about it briefly when you were undergraduates).

More on Big-O and other asymptotics notations

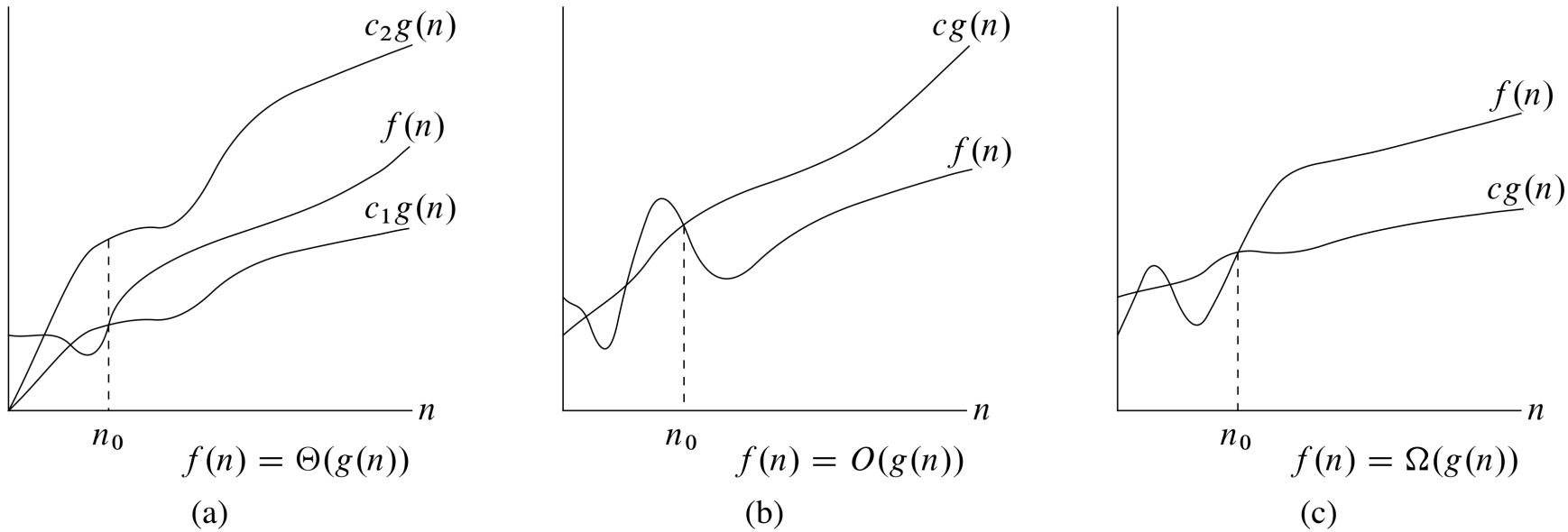

Figure: Meanings of the asymptotics notations O, Ω and Θ