Discussion 0

Sunday, August 26, 2018 7:42 PM

Topic : Introduction

Asymptotics
we want to classify functions

Given $f(n)$, $g(n)$, compute

$$\lim_{n \to \infty} \frac{f(n)}{g(n)} = C$$

Then, we say

- $f(n) = O(g(n))$ if $0 \leq C < \infty$ upper bound
- $f(n) = \Theta(g(n))$ if $0 < C < \infty$ tight bound
- $f(n) = \Omega(g(n))$ if $0 < C \leq \infty$ lower bound

Recurrence Relations

3 ways :)

1) If the recurrence is written as

Q4(1) $T(n) = aT(n/b) + O(n^d)$,

then use Master's Theorem!

$$T(n) = \begin{cases} O(n^d) & \text{if } d > \log_b a \\ O(n^d \log n) & \text{if } d = \log_b a \\ O(n^{\log_b a}) & \text{if } d < \log_b a \end{cases}$$

2) Explicitly solve the recurrence relation (i.e. get an expression

Q4(2) for $T(n)$)

tbh ... at least in 170, this method is rarely used ... more intuitively, try method (3)!

3) Draw recurrence tree and sum up the work at each level

Q4(3)

Useful Summations

- $\sum_{i=0}^{n} i = 1+2+3+\cdots+n = \theta(n^2)$
- $\sum_{i=0}^{n} c^i = \begin{cases} c^n + c^{n-1} + \cdots + 1 = \theta(c^n) & \text{if } c>1 \\ c + c + \cdots + c = \theta(n) & \text{if } c=1 \\ 1 + c + c^2 + \cdots + c^n = \theta(1) & \text{if } c<1 \end{cases}$

You should add more as semester goes