Simple Review

- **Merge Sort**
  - **MERGE(A,p,q,r)**
- **Analysis of Merge Sort－Θ(nlgn), by**
  - **Picture of Recursion Tree**
  - **Telescoping**
  - **Mathematical Induction**
- **Asymptotic Growth**
  - **O-notation**
  - **Ω-notation**
  - **Θ-notation**

Θ-notation

- **Note:**

  --We often think of $f(n) = O(g(n))$ as corresponding to $f(n) \leq g(n)$.

  --Similarly, $f(n) = \Theta(g(n))$ corresponds to $f(n) = g(n)$

  --Similarly, $f(n) = \Omega(g(n))$ corresponds to $f(n) \geq g(n)$

Asymptotic Notation in Equations

- **Used to replace functions of lower-order terms to simplify equations/expressions.**

- **For example,**
  $$4n^3 + 3n^2 + 2n + 1 = 4n^3 + 3n^2 + \Theta(n)$$
  $$= 4n^3 + \Theta(n^2) = \Theta(n^3)$$

Or we can do the following: $4n^3 + 3n^2 + 2n + 1 = 4n^3 + f(n^2)$
Where $f(n^2)$ **simplifies the equation**

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Design and Analysis of Algorithms
Recurrences(Ch4)

Design and Analysis of Algorithms

Recurrences

Topics:
- **Substitution method**
- **Recursion-tree method**
- **Master method**