CS310: ALGORITHMS AND DATA STRUCTURES
Transitivity of Asymptotic Notations

- If $T(n) = \Theta(g(n))$ and $g(n) = \Theta(h(n))$, does this imply that $T(n) = \Theta(h(n))$?
- If $T(n) = O(g(n))$ and $g(n) = O(h(n))$, does this imply that $T(n) = O(h(n))$?
- What about other asymptotic notations?
Reflexivity

- $T(n) = \Theta(T(n))$?
- $T(n) = O(T(n))$?
- $T(n) = \Omega(T(n))$?
Symmetry

- $T(n) = \Theta(f(n)) \Rightarrow f(n) = \Theta(T(n))$?
- $T(n) = \Omega(f(n)) \Rightarrow f(n) = \Omega(T(n))$?
- $T(n) = O(f(n)) \Rightarrow f(n) = O(T(n))$?
- What about $o$ and $\omega$?
Other Properties

- If \( f(n) = \Theta(g(n)) \), then \( g(n) = \Omega(f(n)) \) and vice versa
- If \( f(n) = o(g(n)) \), then \( g(n) = \omega(f(n)) \) and vice versa
Review

- What properties are satisfied by the following asymptotic notations?
  - $\Theta$:
  - $\Omega$:
  - $O$:
  - $\omega$:
  - $o$:
Parallels between Asymptotic Notations and Arithmetic Operators

- \( T(n) = \Theta(f(n)) \iff t = f \)
- \( T(n) = \Omega(f(n)) \iff t \geq f \)
- \( T(n) = O(f(n)) \iff t \leq f \)
- \( T(n) = \omega(f(n)) \iff t > f \)
- \( T(n) = o(f(n)) \iff t < f \)