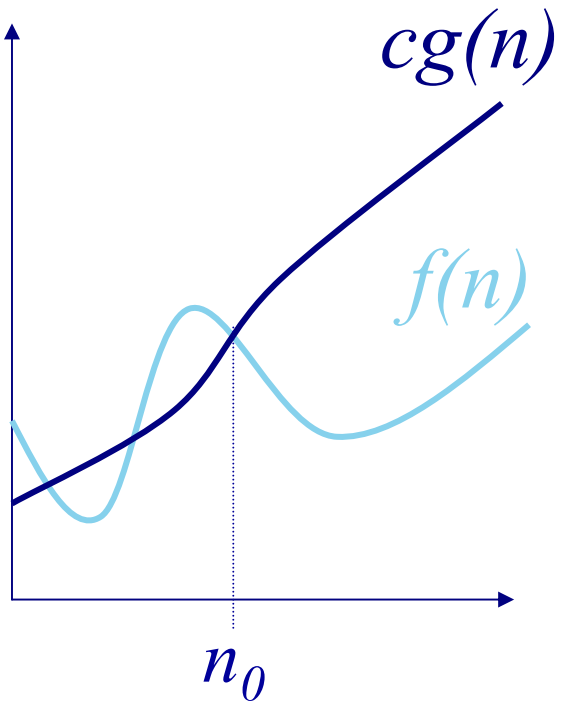
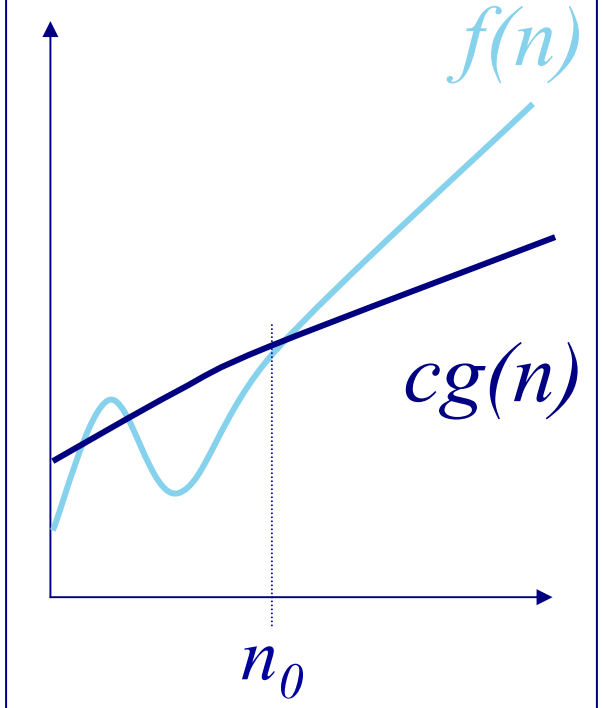
Graphs for O, Ω, and Θ



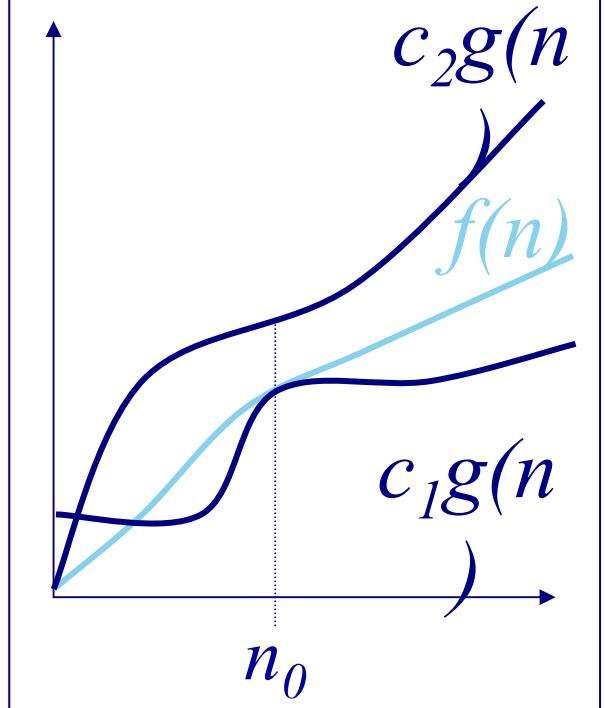
$f(n) = O(g(n))$

Upper bound



$f(n) = \Omega(g(n))$

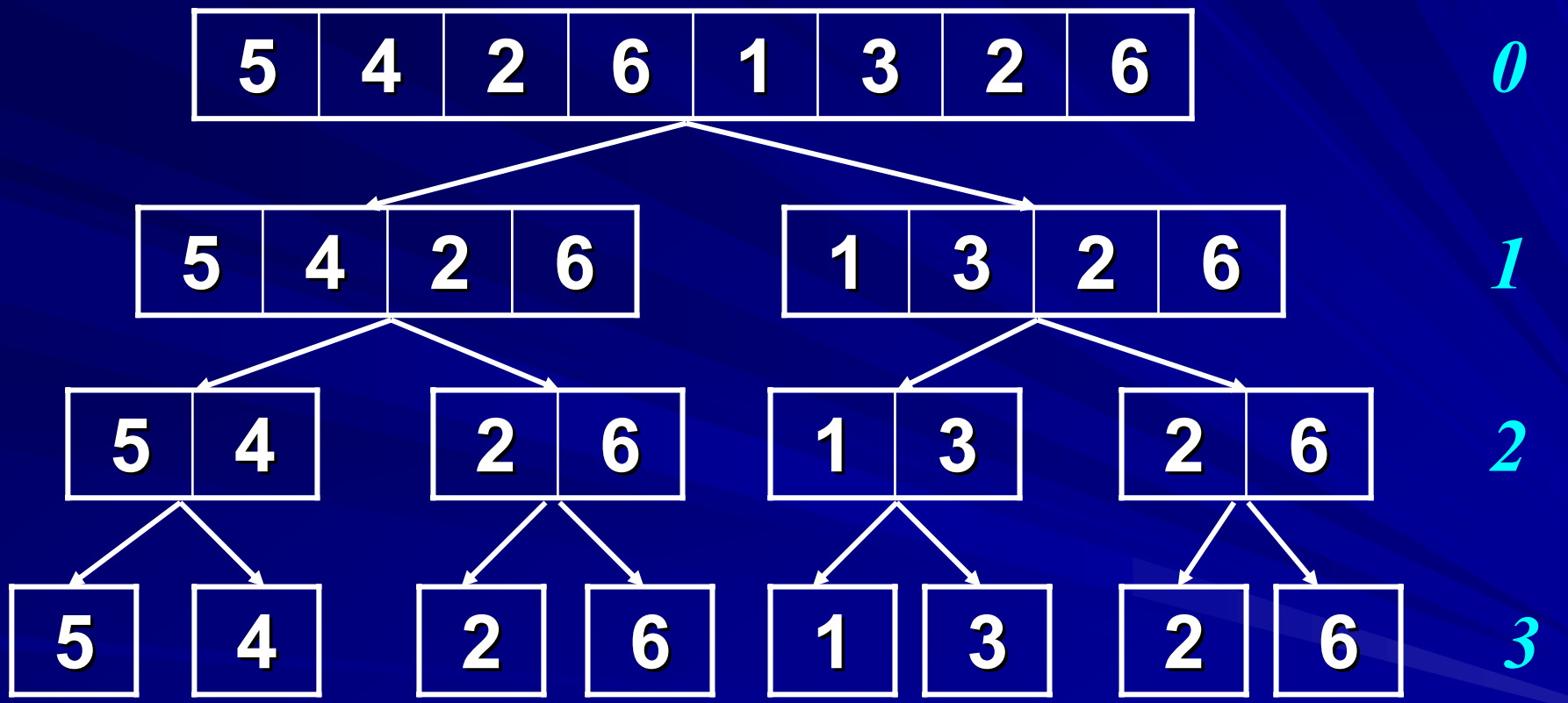
Lower bound



$f(n) = \Theta(g(n))$

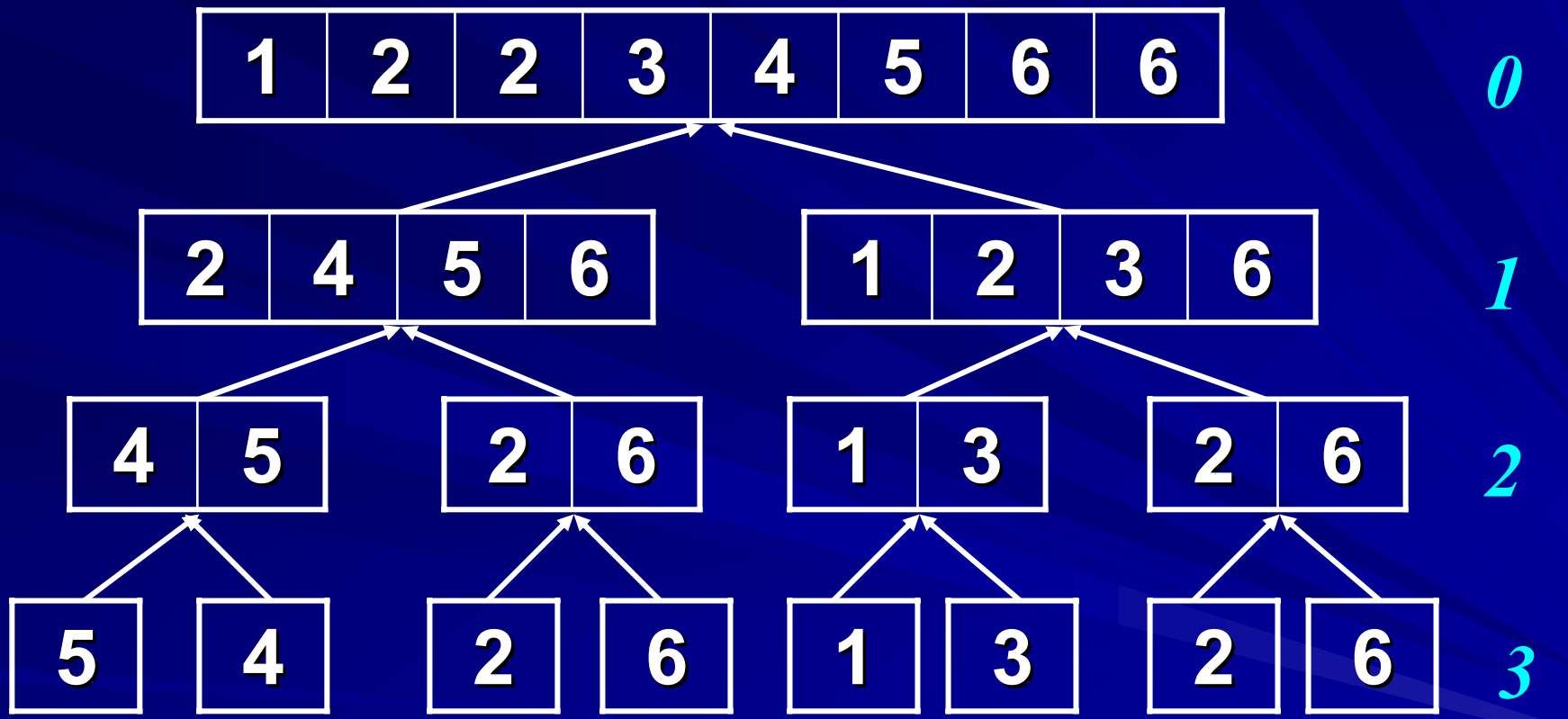
Tight bound

Merge sort (1)



Split phase

Merge sort (2)



Merge phase

The Master Theorem (simple version)

Let $a, b > 1$ be integer constants, and let $T(n)$ be defined on non-negative integers by the recurrence: $T(n) = aT(n/b) + cn^k$ where $c, k \geq 0$

Then

1. $T(n) = \Theta(n^k)$ when $a/b^k < 1$
2. $T(n) = \Theta(n^k \log(n))$ when $a/b^k = 1$
3. $T(n) = \Theta(n^{\log_b a})$ when $a/b^k > 1$