

Homework 2

Friday, September 6, 2024

4:08 PM

$$T(n) = 2T(n/4) + n$$

$$a = 2$$

$$b = 4$$

$$f(n) = n$$

$$\log_a b = \log_2 4 = 2$$

Compare n to $n^{\log_2 4}$

n is slower than n^2

Case 1: Therefore,

If $f(n) = O(n^{\log_b a - \epsilon})$, for some $\epsilon > 0$

$$\begin{aligned} \text{then, } T(n) &= \Theta(n^{\log_b a}) \\ &= \Theta(n^2) \end{aligned}$$

$$2) \quad T(n) = 2T\left(\frac{n}{4}\right) + n^2$$

$$a = 2$$

$$b = 4$$

$$f(n) = n^2$$

$$\log_b a = \log_4 2 = 0.5$$

compare n to $n^{\frac{1}{2}}$

n grows faster than $n^{\frac{1}{2}}$

therefore

Case 3: If $f(n) = \Omega(n^{\log_b a + \epsilon})$ for some constant $\epsilon > 0$

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

$$= \Theta(n^2)$$