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CS421
5 December 2018

Homework 8

4-3 a) $T(n) = 4T(\frac{n}{3}) + n \lg n$

- 1) $a=4$ $b=3$ $f(n) = n \lg n$
- 2) $n^{\log_b a} = n^{\log_3 4}$ $1 < \log_3 4 < 2$
- 3) $n^{\log_3 4} > n \lg n$ (case 1)
- 4) $f(n) = n \lg n = O(n^{\log_3 4 - \epsilon})$
 $n \lg n = n^{\log_3 4 - \epsilon}$
 $1 = \log_3 4 - \epsilon$
 $\epsilon = \log_3 4 - 1 > 0 \checkmark$
- 5) $T(n) = \Theta(n^{\log_3 4})$

4-3 a) $T(n) = 4T(\frac{n}{2}) + n^2 \sqrt{n}$

- 1) $a=4$ $b=2$ $f(n) = n^2 \sqrt{n}$
- 2) $n^{\log_b a} = n^{\log_2 4} = n^2$
- 3) $n^2 = n^2 \sqrt{n}$ (case 2)
- 4) $f(n) = n^2 \sqrt{n} = \Theta(n^{\log_2 4 + \epsilon})$
Epsilon is not applicable for case 2
- 5) $T(n) = \Theta(n^2 \lg n)$

4-3

$$d) T(n) = 3T(n/3 - 2) + n/2$$

$$1) a=3 \quad b=3 \quad f(n) = n/2$$

$$2) n^{\log_b a} = n^{\log_3 3} = n^1$$

$$3) n' = 1/2 n' \quad (\text{case 2})$$

$$4) f(n) = n/2 = \Theta(n')$$

- \in not applicable

$$5) T(n) = \Theta(n \lg n)$$