

Homework 1

CMPSC 465

Kinner Parikh

September 20, 2022

Problem 1:

I did not work in a group
I did not consult without anyone my group member
I did not consult any non-class materials

Problem 2: *Solving recurrences*

a) $T(n) = 11T(n/5) + 13n^{1.3}$

$$W_k = 11^k \times 13(n/5^k)^{1.3}$$

$$\sum_{k=0}^{\log_5 n} W_k = 13n^{1.3} \sum_{k=0}^{\log_5 n} \left(\frac{11}{5^{1.3}}\right)^k = \Theta(13n^{1.3} \cdot \left(\frac{11}{5^{1.3}}\right)^{\log_5 n}) = \boxed{\Theta(13n^{\log_5 11})}$$

b) $T(n) = 6T(n/2) + n^{2.8}$

$$a = 6, b = 2, d = 2.8$$

$$\log_2 6 < 2.8, \text{ so by Master's theorem, } \boxed{\Theta(n^{2.8})}$$

c) $T(n) = 5T(n/3) + \log^2 n$

$$W_k = 5^k \times \log^2(n/3^k)$$

$$\sum_{k=0}^{\log_3 n} W_k = \sum_{k=0}^{\log_3 n} 5^k \times (\log^2 n - k \log^2 3) = \Theta(5^{\log_3 n} \cdot (\log^2 n - \log_3 n \cdot \log^2 3))$$

d) $T(n) = T(n-2) + \log n$

Problem 3: *Sorted Array*

Problem 4: *Linear Time Sorting*