

CMPS 2020 Assignment 2

$$1) W(n) = 2W(n/3) + 1$$

root: 1 → leaf
level 1: 2 → dominated

nodes: 2^1

levels: $\log_3 n \rightarrow O(n^{\log_3 2})$

$$W(n) = 5W(n/4) + n$$

root: $n \rightarrow$ leaf
level 1: $\frac{5n}{4} \rightarrow$ dominated

nodes: 5 1

levels: $\log_4 n \rightarrow O(n^{\log_4 5})$

$$W(n) = 7W(n/7) + n$$

root: $n \rightarrow$ balanced
level 1: $\frac{7n}{7} = n \rightarrow$ balanced

max cost of level: 1

levels: $\log_7 n \rightarrow O(n \log_7 n)$

$$W(n) = 9W(n/3) + n^2$$

root: $n^2 \rightarrow$ balanced
level 1: $9\left(\frac{n}{3}\right)^2 = n^2 \rightarrow$ balanced

max cost of level: n^2
levels: $\log_3 n \rightarrow O(n^2 \log_3 n)$

$$W(n) = 8W(n/2) + n^3$$

root: $n^3 \rightarrow$ balanced
level 1: $8\left(\frac{n}{2}\right)^3 = n^3 \rightarrow$ balanced

max cost of level: n^3

levels: $\log_2 n \rightarrow O(n^3 \log_2 n)$

$$W(n) = 49W(n/25) + n^{3/2} \log n$$

root: $n^{3/2} \log n$ root dominated
level 1: $49\left(\frac{n}{25}\right)^{3/2} \log\left(\frac{n}{25}\right) = \frac{49}{25} n^{3/2} \log\left(\frac{n}{25}\right)$

$O(n^{3/2} \log n)$