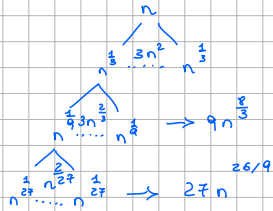


## Esercizio 1

$$T(n) = \begin{cases} 1, & \text{se } n \leq 27 \\ 3n^2 \cdot T(\sqrt[3]{n}) + 2n^3, & \text{altrimenti} \end{cases}$$

Livello	Nodi per livello	dimensione in input	Contributo per nodo	Contributo totale per livello
0	1	$n$	$2n^3$	$2n^3$
1	$3n^2$	$n^{\frac{1}{3}}$	$2n$	$6n^3$
2	$9n^{\frac{4}{3}}$	$n^{\frac{1}{9}}$	$2n^{\frac{1}{3}}$	$18n^3$
3	$27n^{\frac{26}{9}}$	$n^{\frac{1}{27}}$	$2n^{\frac{1}{9}}$	$54n^3$
i	$3^i n^{\frac{3^i-1}{3^i-2}}$	$n^{\frac{1}{3^i}}$	$2n^{\frac{3}{3^i}}$	$3^i \cdot 2n^3$



Calcolo l'altezza:

$$\begin{aligned} n^{\frac{1}{3^h}} &\leq 27 \Leftrightarrow \frac{1}{3^h} \log_3(n) \leq 3 \Leftrightarrow 3 \cdot 3^h \geq \log_3(n) \Leftrightarrow 1+h \geq \log_3(\log_3(n)) \Leftrightarrow \\ &\Leftrightarrow h \geq \log_3(\log_3(n)) - 1 \end{aligned}$$

Calcolo la sommatoria:

$$\begin{aligned} \sum_{i=0}^h 3^i 2n^3 &= 2n^3 \sum_{i=0}^h 3^i = 2n^3 \cdot \frac{3^{h+1} - 1}{3 - 1} = n^3 (3 \cdot 3^{\log_3(\log_3(n)) - 1} - 1) = n^3 (3 \cdot 3^{\log_3(\log_3(n))} \cdot 3^{-1} - 1) = \\ &= n^3 (\log_3(n) - 1) = n^3 \log_3(n) - n^3 \Rightarrow \mathcal{O}(n^3 \log_3(n)) \end{aligned}$$

