10) 1. rec 2

$$T(n)\begin{cases} c & n <= 1 \\ c + T(n-1) & n \geq 2 \end{cases}$$

paso 1 $c + T(n-1)$ $n \geq 2$

paso 2 $c + [c + T(n-1-1)]$ $n-1 \geq 2$

paso 3 $c + \{c + [c + T(n-1-1-1)]\}$ $n-2 \geq 2$

$3c + T(n-3)$

paso i $T(n) = ic + T(n-i)$

$n - i \leq 1$

$n \leq 1 - i$

$n+1 \leq -i$

$n-1 \leq i$

$O(n)$

$\uparrow$

$(n-1)c + T(n-(n-1)) = nc_2 - c_2 + c_1$

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2. rec 1

$$T(n)\begin{cases} c & n \leq 1 \\ c + 2 \cdot T(n-1) & n \geq 2 \end{cases}$$

paso 1: $c + 2 \cdot T(n-1)$ $n \geq 2$

paso 2: $c + 2[c + 2 \cdot T(n-1-1)]$ $n \geq 2$

paso 3: $c + 2\{c + 2 \cdot [c + 2 \cdot T(n-1-1-1)]\}$

$c + 2[c + 2c + 4T(n-3)] = c + 2c + 4c + 8T(n-3)$

$7c + 8T(n-3)$

paso i: $2^i - 1c + 2^i T(n-i)$

$n-i \leq 1 \Rightarrow -i \leq 1-n \Rightarrow i \geq -1+n$

$$\left(2^{n-1}-1c\right) + \left(2^{n-1} \cdot T(n-(n-1))\right)$$

$$= \frac{2^{n}}{2} - 1c_2 + \frac{2^{n}}{2} \cdot c_1 = T(n) \rightarrow O(2^n)$$

3.

rec3

$$T \begin{cases} c_1 & n=0 \\ T(n) = \begin{cases} c_2 & n=1 \\ 2 \cdot T(n-2) + c_3 & n <> 1 \end{cases} \end{cases}$$

$2(2(\cdot 2 + c_3) + c_3) c_3$

$(2(2c_3)c_3)$

$1+2 \quad 4$

paso 1: $2T(n-2)+c_3$

paso 2: $2 \cdot [2T(n-2-2)+c_3]+c_3$

paso 3: $2\{2[2T(n-2-2-2)+c_3]+c_3\}+c_3$

$8T(n-6)+7c_3$

paso i: $2^i T[n-(i \cdot 2)] + (2^i-1)c_3$

$n-2i=1 \rightarrow n=1+2i \rightarrow \frac{n-1}{2}=i$

$2^{\frac{n-1}{2}} T\left(n-2\cdot\left(\frac{n-1}{2}\right)\right)+\left(2^{\frac{n-1}{2}}-1\right)c_3$

$2^{\frac{n-1}{2}} \cdot c_2 + \left(2^{\frac{n-1}{2}}-1\right) \cdot c_3$

$\sqrt[2]{2^{n-1}} \cdot c_2 + \left(\sqrt[2]{2^{n-1}}-1\right) \cdot c_3$

$\sqrt{\frac{2^n}{2}} \cdot c_2 + \left(\sqrt{\frac{2^n}{2}}-1\right) \cdot c_3$

$\rightarrow \sqrt{2^n} \cdot \sqrt{\frac{1}{2}} \cdot c_2 + \left(\sqrt{2^n} \cdot \sqrt{\frac{1}{2}} \cdot c_3 - c_3\right)$

$$T(n) \begin{cases} c_1 & n=0 \\ \sqrt{2^n} \cdot \sqrt{\frac{1}{2}} \cdot c_2 + \sqrt{2^n} \cdot \sqrt{\frac{1}{2}} \cdot c_3 - c_3 \end{cases}$$

$c \quad c = \sqrt{2^n} \qquad O(\sqrt{2^n})$

$T(n) = \sqrt{2^n} \cdot \sqrt{\frac{1}{2}} c_2 + \sqrt{2^n}\sqrt{\frac{1}{2}} c_3 - c_3$

4.

potencia_iter

$$T(n) = c_1 + c_2 + c_3 + c_4 \cdot \sum_{i=2}^{i \leq n} c_5 + c_6$$

declaracon evaluacion if

evaluacion if en el else

potencia = x

for

return

$$T(n) = c_1 + \max(T(n)_2, T(n)_3)$$

$$T(n)_1 = c_2 \qquad T(n)_2 = \max(T(n)_3, T(n)_4)$$

$$T(n)_3 = c_3 \qquad T(n)_4 = c_4 + \sum_{i=2}^{n} c_5$$

$$\sum_{i=1}^{n} -1$$

$$c_4 + ((n - 1 + 1) - 1) c_5$$

$$c_4 + n c_5 - c_5$$

$$c_3 < c_4 + n c_5 - c_5$$

$$T(n)_2 = T(n)_4$$

$$T(n) = c_1 + c_4 + n c_5 - c_5 \rightarrow O(n)$$

5.

$T(n) = c_1 + \max(T(n/2), T(n/3))$

$T(n/2) \to c_2$

$T(n/3) \to c_3 + \max(T(n/3), T(n/4))$

$$T(n) \begin{cases} c_1 & n \leq 1 \\ c_3 + (T(n/2)) + c_4 \end{cases}$$

paso 1: $c_3 + (T(n/2)) + c_4$ $\quad n > 1$

paso 2: $c_3 + (c_3 + T(n/2/2)) + c_4) + c_4$ $\quad n/2 > 1$

paso 3: $c_3 + (c_3 + (c_3 + T(n/2/2/2)) + c_4) + c_4) + c_4$ $\quad n/4 > 1$

paso i: $i c_3 + T(n/2^i) + i c_4$

$\frac{N}{2^i} \leq 1 \to N \leq 2^i \to \log_2(n) \leq i$

$T(N/N) + \log_2(n) c_3 + \log_2(n) c_4$

$c_1 + \log_2(n) c_3 + \log_2(n) c_4 \to O(\log_2(n))$