Actividad 9.1

```
if fibonacci (int n) {
    if(n==0) cond1
        return 0; ret1
    else if (n==1) cond2
        return 1; ret2
    else
        return fibonacci(n-1) + fibonacci(n-2)
}
```

$$T(n) = \begin{cases} n=0: & T(cond_1) + T(ret_1) = t + t = 2t \\ n=1: & T(cond_1) + T(cond_2) + T(ret_2) = t + t + t = 3t \\ n>1: & T(cond_1) + T(cond_2) + T(n-1) + T(n-2) = 3t + T(n-1) + T(n-2) \end{cases}$$

$$T(n) = 3t + \underline{T(n-1)} + \underline{T(n-2)}$$

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

$$= 9t + T(n-2) + 2T(n-3) + T(n-4)$$

$$= 9t + [3t + T(n-3) + T(n-4) + 2] + 2[3t + T(n-4) + T(n-5)] + [3t + T(n-5) + T(n-6)]$$

$$= 24t + T(n-3) + 3T(n-4) + 3T(n-5) + T(n-6)$$

<u>No hay patrón</u>

$$T(n-1) > T(n-2) \rightarrow 3t + T(n-1) + T(n-1) > 3t + T(n-1) + T(n-2)$$

Resolviendo

$$T(n) = 3t + T(n-1) + T(n-1) = 3t + 2T(n-1)$$

$$= 3t + 2[3t + 2T(n-2)] = (1+2)3t + 2^2 T(n-2)$$

$$= (1+2)3t + 2^2[3t + 2T(n-3)] = (1+2+3)3t + 2^3 T(n-3)$$

$$= (1+2+3)3t + 2^3[3t + 2T(n-4)]$$

K-ésima expansión

$T(n) = (2^0, 2^1, 2^2, \ldots, + 2^{k-1}) 3t + 2^n (T(n-n))$

$T(0) = 2t \rightarrow n = k = 0$

$T(1) = 3t \quad n = 1$

Sustituimos en K

$T(n) = (2^0, 2^1, 2^2, 2^3 \ldots 2^{k-1}) 3t + 2^n T(0)$

$= (2^0 + 2^1 + 2^2 + 2^{k-1}) 3t + 2^n (T(0))$

$T(n) = (2^0, 2^1, 2^2 \ldots 2^{k-1}) 3 + 2^{n+1}$

2 $O(T(n)) = O((2^0, 2^1, 2^2 \ldots 2^{n-1}) 3 + 2^{n+1})$

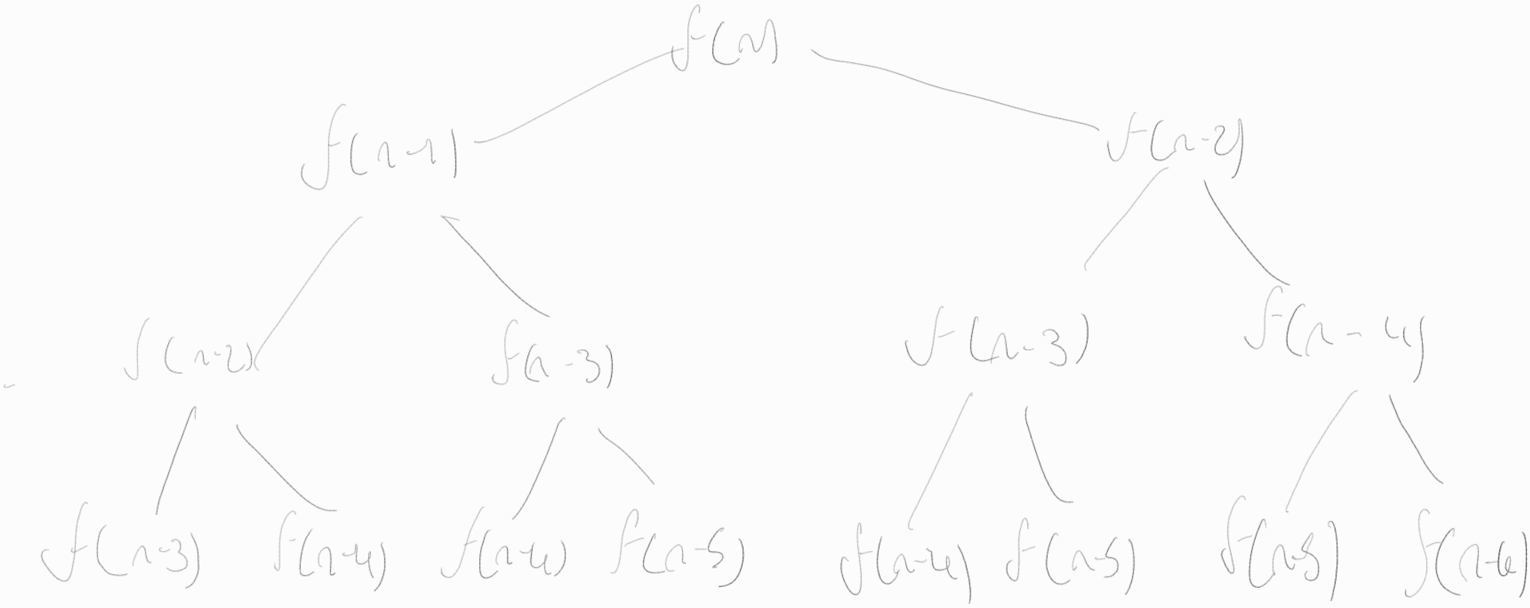
Regla de Suma

$= \max(O3(2^0), O3(2^1), O3(2^2) \ldots O3(2^{n-1}), O(2^{n+1}))$

$= O(2^{n+1})$

- Constantes

$O(T(n)) = O(n) = 2^4$



int fibonacci (int n) {

③ int fib (int n, int d1)

④ if (n==0){ cond1
return 0 ret1

else if (n==1){ cond2
n1=0 asig
return 1; ret2
} else{ int n2=0 Asig2
n1= fib(n-1, n-2)
return n1+n2; ret3

$$T(n)\begin{cases} n=0 = T(cond_1) + T(ret_1) = t + t = 2t \\ n==1 = T(cond_1) + T(cond_2) + T(asig_1) + T(ret_2) = 4t \\ n>1.\ T(cond_1) + T(cond_2) + T(asig_2) + T(n-1) + T(ret_3) = 4t + T(n-1) \end{cases}$$

Expansión

$$T(n) = 4t + T(n-1)$$

$$= 4t + [4t + T(n-2)] = 2(4t) + T(n-2)$$

$$= 4t + [4t + T(n-3)] = (3)(4t) + T(n-3)$$

$$= 3(4t) + [4t + T(n-4)] = (4)4t + T(n-4)$$

K-ésima expansión

$$T(n) = (K)4t + T(n-k)$$

$$T(0) = 2t$$
$$T(1) = 4t$$
$$\rightarrow n - K = 0 \rightarrow n = K$$

$$\rightarrow T(n) = n4t + T(0) = 4nt + T(0) = 4nt + 2t$$

$$\rightarrow T(n) = 4n + 2$$

$$O(T(n)) = O(4n+2) = n$$