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Assignment 1 – Programming Question

a)

Pseudo Code:

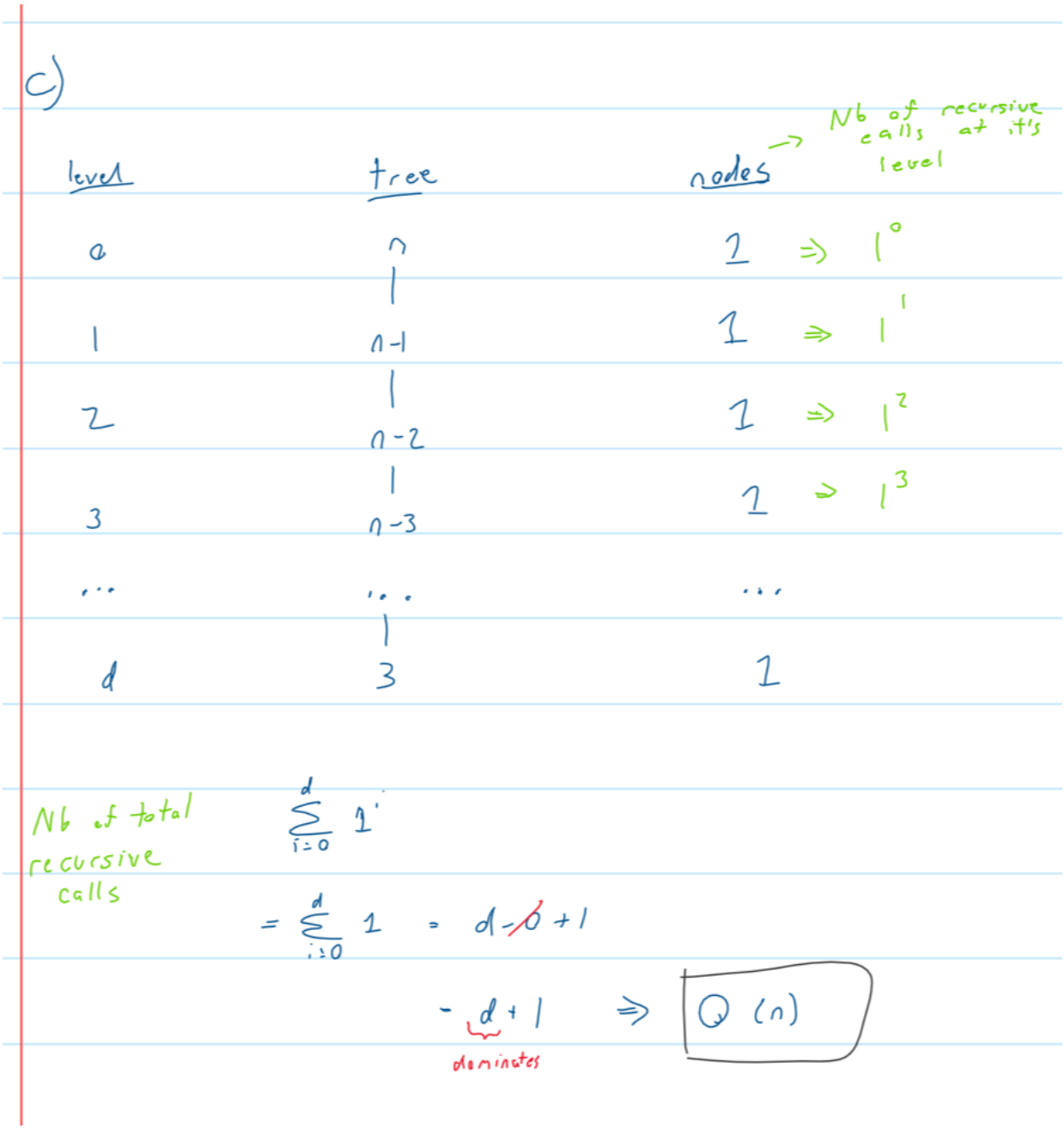
```
ExponentialTetranacci(n):
        INPUT: Integer n
        OUTPUT: The n'th tetranacci number
        START:
           if n = 0 then return 0
           if n = 1 then return 0
           if n = 2 then return 0
           if n = 3 then return 1

           return ExponentialTetranacci(n-1) + ExponentialTetranacci(n-2) +
ExponentialTetranacci(n-3) + ExponentialTetranacci(n-4)
        END
```

b)

Pseudo Code:

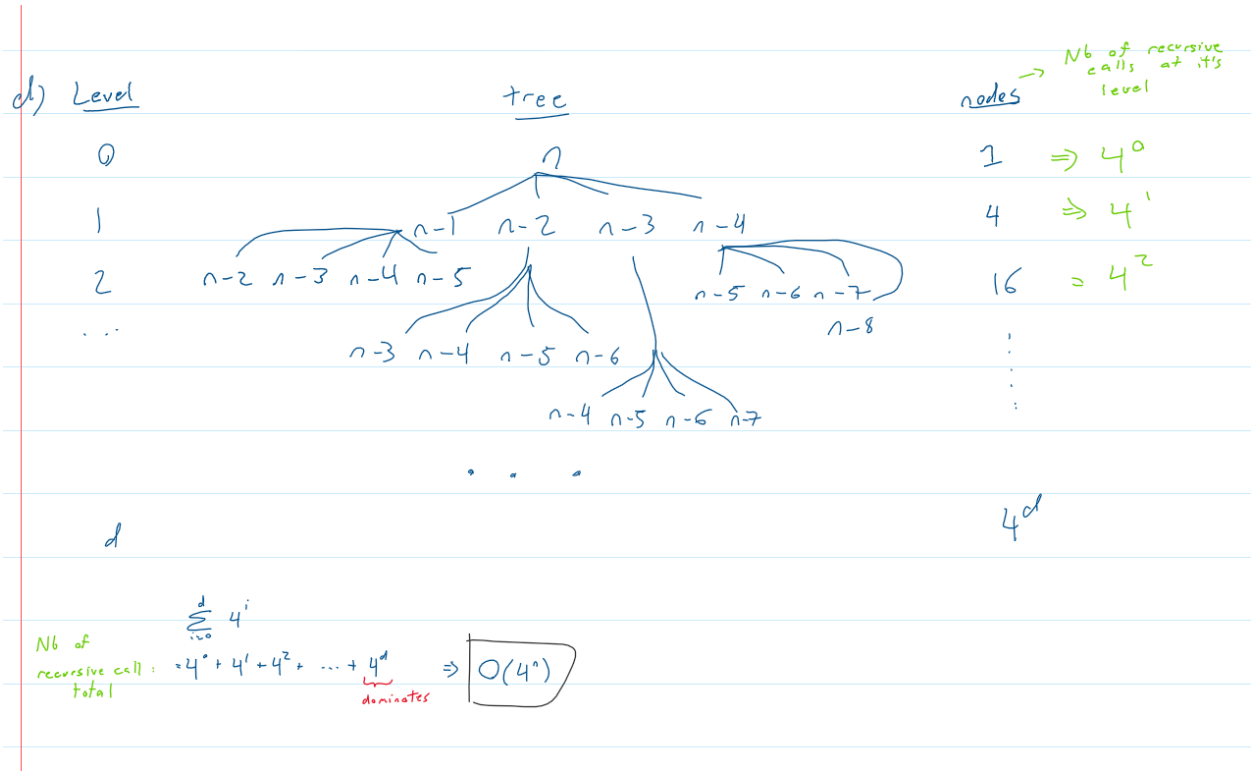
```
TRTetranacci(n, base0, base1, base2, base3):
        INPUT: Integer n and the previoud 4 calculations, starting with the base cases
        OUTPUT: The n'th tetranacci number
        BEGIN:
           if n = 0 then return base0
           if n = 1 then return base1
           if n = 2 then return base2
           if n = 3 then return base3

           TRTetranacci(n - 1, base1, base2, base3, base0 + base1 + base2 + base3)
        END
```

c)



The Tail Recursive Tetranacci calculation is Linear since there is only 1 recursive call to itself at any point.

d)



Exponential Tetranacci has an Exponential time complexity because each time you calculate the value of an n’th number, you have to recalculate all the 4 values before it, each recursive call will call itself 4 times.