Hometask-2

Please submit your solutions by email: Boris.Kirikov@edu.mamk.fi

1.

a. Solve recurrent: $a_{n+2} = a_{n+1} + 6a_n + n \quad (a_0 = 0, a_1 = 1)$
b. Give Θ-estimation: $T(n) = 8T(n/2) + n^3$
c. Show that harmonic series diverges and give estimation: $H_n = \sum^n \frac{1}{k}$
d. Algo solves problem of size n by solving problem for $n-1$ and some linear in time work after. What is its complexity?

2. Calculate:

a.
$$\sum_{n=0}^{\infty} \frac{F_n}{3^n}$$

b.
$$\sum_{n=0}^{\infty} \frac{n^2 + 4n + 7}{n!}$$

Hint: remember fomula: $e^t = \sum_{n=0}^{\infty} \frac{t^n}{n!}$.

3. You are given an array `int * A` but you do not know its length. But you are given a function `bool out_of_bounds(int * x)` which checks if pointer is out of array bounds. How to find length of array in $n \log n$ time?

4. You are given a sorted int array. You need to find whether there is such `i` that `A[i] == i` in $\log n$ time.

5. Show that there can not be method for searching in sorted array faster than $\log n$.