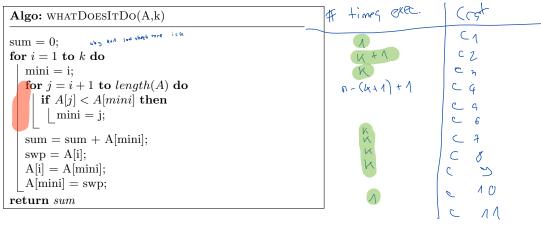


## Informatics II Exercise 3

Mar 02, 2020

## Algorithmic Complexity and Correctness

**Task 1.** Algorithm whatDoesItDo(A,k) gets an array A[1...n] of n integers as an input.



- a) Implement the algorithm as a C program that reads the elements of A and prints the result.
- **b)** Describe what the algorithm does.
- c) Do an exact analysis of the running time of the algorithm.
- d) Determine the best and the worst case of the algorithm. What is the running time and asymptotic complexity in each case?
- e) What influence has the parameter k in the asymptotic complexity?

## **Asymptotic Complexity**

Task 2. Calculate the asymptotic tight bound for the following functions and rank them by their order of growth (lowest first). Clearly work out the calcula-



tion steps in your solution.  $f_{1}(n) = n^{n} + 2^{2n} + 13^{424} \quad \text{for } 1 \text{ for }$ 

**Task 3.** Given two strings A and B, develop an algorithm that checks if B is a substring of A and, if so, returns the number of occurrences of B in A.

- a) Specify all the special cases that need to be considered and provide examples of the input data for each of them.
- b) Write a C program implementing your algorithm and make sure it runs for all the special cases you provided. Include a function int substrings(char A[], char B[]) which returns the number of occurrences of B in A. Your program should print the number of occurrences along with the starting and ending index of each occurrence. Here is an example output corresponding to the call substrings([nitrite], [it]):

$$A = [nitrite]$$

$$B = [it]$$

$$Indices = (2,3) (5,6)$$

$$Repetitions = 2$$

Attention! You are not allowed to use string-functions and/or string.h.