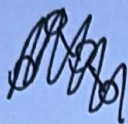# Algorithms 2022/2023

Solve the following exercises.

1. Consider the following statement: "If G is a graph on n nodes and $n - 1$ edges, then G has no cycles."

   Is the statement true or false? Give a proof, or a counterexample.

2. A substring of a string s is any sequence of contiguous characters of s (for instance, "abc" has the following 7 distinct substrings: "a", "ab", "abc", "b", "bc", "c", ""); in particular, if s has length n, then the substrings of s are all and only the strings $s[i : j]$ for $0 \leq i \leq j \leq n$. Give an algorithm that, given two strings s and t of the same length n, returns the length of the longest string that is a substring of both s and t. Prove that your algorithm is correct, and bound its running time. *Larger scores will be awarded to faster solutions.*

   Example 1: if $s = $ "abcdfe" and $t = $ "acdfet", then the unique longest substring ("cdfe") has length 4;

   Example 2: if $s = $ "abc" and $t = $ "acd", then each longest substring has length 1 (the longest substrings are "a" and "c").