

1) Regarding the celebrity problem that we discussed in the class, implement the modified algorithm with time complexity of $\Theta(n)$ in your favorite language.

10 points

2) For the Maximum Consecutive Subsequence problem, improve the proposed $\Theta(n)$ algorithm such that it not only returns the maximum sum, but also returns the corresponding subsequence. No implementation is needed.

10 points

3) Let $f(n)$ and $g(n)$ be asymptotically positive functions. Prove or disprove each of the following conjectures:

a) $f(n) = O(g(n))$ implies $g(n) = O(f(n))$

b) $f(n) = \Theta\left(f\left(\frac{n}{2}\right)\right)$

c) $f(n) = O(g(n))$ implies $\log f(n) = O(\log g(n))$ where $\log g(n) \geq 1$ and $f(n) \geq 1$ for all sufficiently large n .

[from CLRS 3.4]

30 points