CS610 (2017) Homework 1

August 8, 2017

Write down the names of your collaborators. Please follow the honor code as outlined on the class webpage. Please submit a single pdf that contains typed up/scanned answers. Using Latex is strongly advised. For each problem, besides writing down the algorithm, please write down 1) a clear analysis of complexity 2) a clear claim of correctness and 3) a proof of the claim.

1. Consider the problem of calculating $N! = 1 \cdot 2 \dots (n-1) \cdot n$.

    (a) If N is a n bit number, then how many bits long is $N!$, approximately in $\Theta(\cdot)$ form.

    (b) Give an algorithm to calculate $N!$ and analyze its running time.

2. Design a linear time algorithm which, given an undirected graph G and particular edge e in G, determines whether there is a cycle in G containing e.

3. Problem 6 (analyzing the complexity of a function) of Chapter 2 of KT.

4. Problem 4 (labeling butterflies) in Chapter 3 of KT.

5. Problem 8 (average pairwise distance in the Internet) in Chapter 3 of KT.

6. Problem 12 (fixing an oral survey of births and deaths) in Chapter 3 of KT.