Honor Code

The Honor Code for CS300 Students

Students enrolled at the KAIST CS200 course are expected to respect personal honor and the rights of others, and they must possess personal integrity and honesty. The students will neither give nor receive any unauthorized aid in class work that is to be graded by the instructor. The following acts are regarded as violations of academic integrity and honesty.

- Referring from other students'/publisher's solutions, assignments, and reports.
- Allowing another student to refer from one's own work
- Submitting another student's work as his or her own
- Unpermitted collaboration or aid on take-home examinations and class assignments
- Plagiarism: the use of another person's original work without giving reasonable and appropriate credit to or acknowledging the author or source

The professor will determine whether any violation has occurred and the appropriate penalty for the violation.

"I have read and agree to abide by all of the above rules and policies, and pledge that I will neither give nor receive any unauthorized aid on examinations or other class assignments that are used by the instructor as the basis for grading."

Student's Name: _____ (Signature)

Date : _____

(This Honor Code format was originally generated for CS320 instructed by Prof. Sukyoung Ryu.)

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CS300

Fall 2018, Assignment #1

PROBLEM 1 (3+3+2+1+1P)**:**
Recall the Bachmann–Landau symbols $\mathcal{O}$, Ω, Θ of asymptotic growth of functions $f, g : \mathbb{N} \to [1;\infty)$.

a) Classify the asymptotic growth of the following functions w.r.t. $\Theta()$ as logarithmic, polynomial, exponential, or in-between:

$$\text{(i) } \log(n!), \quad \text{(ii) } n^{\log\log n/\log n}, \quad \text{(iii) } 2^{(\log n)^2}.$$

Justify your answers!

b) Determine the asymptotic growth of the following recurrences with the *Master Theorem*:

i) $T(n) = 8 \cdot T(n/3) + \mathcal{O}(n^2)$.
ii) $T(n) = 9 \cdot T(n/3) + \mathcal{O}(n^2)$.
iii) $T(n) = 10 \cdot T(n/3) + \mathcal{O}(n^2)$.

c) Describe an algorithm computing $X^{2^{16}-1}$ from X using ≤ 32 multiplications and no other operations.

d) Verify the correctness of Strassen's algorithm for multiplying two 2×2 matrices.

e) Verify the correctness of "Karatsuba's Law" from the lecture.

Bonus (1P): Describe an algorithm computing $X^{2^{16}-1}$ from X using ≤ 19 multiplications and no other operations.