Gebze Technical University – Department of Computer Engineering
CSE222/505 – Spring 2025
Homework 2
Due date: 17 March 2025, 23:59

1) (36 PTS) Show each statement either true or false by using limit derivation. No limit derivation will not be graded

a) $2^{2n} + 1 = O(2^n)$
b) $n^3 - 4n^2 + 7 = \theta(2^n)$
c) $n^3(1 + \sqrt{n}) = O(n^3 logn)$
d) $28n = O(7n^2)$
e) $n + logn + 21 = O(7n^2)$
f) $n^2 + 9n - 13 = \theta(n^2)$

2) (14 PTS) Order each of the following functions by growth rate. Show each step. Not showing each step will not be graded.

$$2n^2, 3n^4, 7n, logn, 3^n, n!$$

3) (30 PTS) Analyze worse case complexity of each function.

a)
```
static void someFunction(int a, int b) {
        int sum = 0;
        for (int i = 0; < i < a; i++)
              for(int j = 0; j < b; j++)
                    sum += i + b;
```

b)
```
static void anotherFunction(int a) {
        int sum = 0;
        for (int i = 0; < i < a; i++)
                    sum += i;
                    i = i * 2
```

c)
```
static void differentFunction(int n) {
        for (int i = 0; i < n; i++)
              for(int j = 0; j < n; j++)
                    for(int k = 0; k < n; k++)
                          System.out.println("Hello, world!")
}
```

4) (20 PTS) A toy manufacturing company wants to test how durable their brand-new toy is. The company owns a building with 100 floors. The company has an infinite supply of toys. They want you to find the lowest floor on which their toy would break. How can you do this in the fastest way? Explain your proposed method. And show the complexity.

Homework 2 Notes:
-Cheating is not allowed including using LLMs. Students who cheat will receive NA from this course.

-There will be no demo session for this homework. You will just use pencil and paper. Please show each step with details. Giving not sufficient details might lead to no grade or partial grade for the question even if answer is correct.

-Scan the paper that your solutions written on with your phone. Write your name, student number in every page you used. Just upload a single PDF. The PDF must be named like this Name_Surname_Student_Number_CSE_222_HW2_Solutions

-Blurry and non-readable PDFs will not be graded. All answers should be in order like Q1, Q2, Q3, Q4. If the PDF will not be in order, you will get -10 points.

-The deadline is very strict. There will not be any delays, and late submissions will not be accepted.

Good luck. – Burak Dikmen

For the further questions please e-mail to a.dikmen2022@gtu.edu.tr