COP3530 – Assignment 1

# Objective

Students will be able to determine the relation between the growth rate of functions, use asymptotic notations, determine the time complexity of programs, and compare the running times of given time complexities.

# Assignment Questions

1. (This exercise is a variation of Exercise 2.1 in Chapter 2 of the textbook) Order the following functions according to their growth rates from slowest to fastest:

1. Using the definition of Big-Oh discussed in class, to prove that 10n = O(n2) we can select \_\_\_.

* 1. c = 0, n0 = 1
  2. c = 1, n0 = 1
  3. c = 2, n0 = 5
  4. c = 1, n0 = 9

1. (This exercise is a variation of Exercise 2.7 in Chapter 2 of the textbook) For each of the following program fragments, determine the time complexity: O(n), O(2n), O(n2), O(n × i), O(i2), O(n × i2), or O(n3). Size of the input is **n** in each case.

1. Suppose that four algorithms have been devised for a certain problem. The expression of the time complexity of each of them is listed below. Assume that 1 operation takes 1 millisecond to run. What is the maximum size of the input that can be used if the total running time can be at most 1 second?

* 1. 25 log n

* 1. 10n

* 1. 5n2
  2. 2n

1. Assume that for input size n = 16, the implementation of a certain algorithm A takes 1 nanosecond

(ns) to run. How many nanoseconds will it take to run an input size of n = 64, if the time complexity of A is

* 1. O(log n)
  2. O(n)
  3. O(n log n)
  4. O(n2)

# Guidelines

* The assignment is to be completed individually.

* This document only contains the instructions pertaining to the first assignment. Answers will be entered in quiz titled **Assignment 1**. Read carefully this document, answer the questions, and when you are ready, open the quiz and enter the answers.

# Grading Rubric

The assignment is worth 100 points (out of 1000 total course points). Grade components:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Component** | **Points** | **Description** | |  | |
| Content | 100 | **Question** | | **Points** | |
|  | 1 | 20 pts |  |
| 2 | 20 pts |
| 3 | 20 pts |
| 4 | 20 pts |
| 5 | 20 pts |