

CS302 Data Structures
Fall 2009 – Dr. George Bebis
Homework 2 - Due Date: 9/22/2009

1. Rank the following functions by order of growth from the slowest to the fastest (notation:
 $\lg n = \log_2 n$)

1000, $10 \lg n$, $4n^2$, n^2 , 2^n , $100n$, $2^{\lg n}$

2. Compare the two functions n^2 and $2^n/4$ for various values of n . Determine when the second becomes larger than the first.
3. Determine the time complexity of the following code segments. In each case, justify your answer.

<p>(a) sum = 0; for(i=1; i<=2*n; i++) sum = sum + 1;</p>	<p>(b) sum = 0; for(i=1; i<=n*n; i++) sum = sum + 1;</p>	<p>(c) sum=0; for(i=1; i<=n; i++) sum = sum + n;</p>
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<p>(d) sum = 0; for(i=1; i<=n i++) for(j=1; j<=i; j++) sum = sum + i;</p>	<p>(e) sum = 0; for(i=1; i<=100; i++) for(j=1; j<=n; j++) sum = sum + i;</p>	<p>(f) sum = 0; for(i=1; i<=n; i++) for(j=1; i<=n; j*=2) sum = sum + 1;</p>
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4. Give the complexity of the functions below using big-O notation

- a. $5n + n^2 - 2$
- b. 7
- c. $4n + 10 \lg n + 25$
- d. $3 + 4 \lg n$
- e. $n^2 + n^3 + 10$

5. (a) Explain how to analyze the running time requirements of (i) a for-loop, (b) a while-loop, and (c) an if-then-else statement.

(b) A program's main function consists of two function calls in sequence. The first function that is called has a time complexity of $O(100 \lg n)$, and the second function has a time complexity of $O(n)$, What is the overall time complexity of the program? Justify your answer.