**CSC 316** - Data Structures

**Homework Assignment #1 Answers**

John Averill - August 25, 2016

**Problem 1.1**

1. We should expect Gaussian elimination to work 8 times longer on a system of 1000 equations versus a system of 500 equations. This is because Gaussian elimination is O(n3), and when we double the input size of n from 500 to 1000 on the algorithm’s basic input operation of 1/3n3 (which is O(n3)), we increase the running time by a factor of 8.
2. Because the basic operation of 1/3n3 is O(n3) and has a time complexity of *n*3, a computer that is 1000 times faster will run the algorithm 10 times faster (this is based on the slide “Effects of Hardware Improvements” from the “Algorithms Analysis and Recursion” lecture). n3 1000 times faster = = 10.

**Problem 1.2**

1. 5 log2(*n* + 100)10
2. log2*n* [assumed that this notation indicates (log2*n*)2, or the result of the log raised to 2nd power]
3. 0.001*n*4 + 3*n*3 + 1
4. 3*n*
5. 22*n*
6. (*n* − 1)!

**Problem 1.3**

1. Because we are looking for the sum of every odd number from 1 to 999 we are summing up half the numbers, so there are 500 numbers being summed. So using an arithmetic sequence we have Sn = n(a1 + an)/2 🡪 S500 = 500(1 + 999)/2 = (500 \* 1000) / 2 = 500000 / 2 = 250,000.
2. Each term in the sum is being increased by 2n and the upper limit of 1024 = 210. So there are 10 values in the sum. *i* = (ck – cl+1)/(1 – c) = *i* = (21 – 210+1)/(1 – 2) = (2– 2048)/(1 - 2) = -2046 / -1 = 2046
3. <todo>
4. <todo>
5. <todo>

**Problem 1.4**

1. <todo>
2. <todo>
3. <todo>
4. <todo>
5. <todo>
6. <todo>

**Problem 1.5**

1. <todo>
2. <todo>
3. <todo>
4. <todo>
5. <todo>
6. <todo>

**Problem 1.6**

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**Problem 1.7**