GIT Department of Computer Engineering
CSE 222/505 - Spring 2015
Homework 02
Due date: March 2 2016 – 16:00 AM

1. Calculate the running time of the function below. Assume that your function is implemented
   - by using array list
   - by using linked list

   Show your calculation in most convenient notation. (Big O/Teta/Omega)

```
BUBBLESORT(A)
1  for i = 1 to A.length − 1
2      for j = A.length downto i + 1
3          if A[j] < A[j − 1]
4              exchange A[j] with A[j − 1]
```

2. Sort the following functions from slowest to fastest in terms of their growth.

   $n^{2.56}$,log(n!), nlogn, $\mathbf{loglog}n^2$

3. Prove using only the definitions of asymptotic notations
   - n^2 is in O(2^n)
   - n! is in Ω(2^n)
   - logn is in Θ(log_{64}n)

4. Prove that $2n^2$- 4n +9=$\Theta(n^2)$ using induction.
5. Is Big-O an equivalence relation? Show classes and prove your answer.
6. Calculate the running time of the loops below.
   - for (int i = 1 ; i < n^2 ; i+=5)
     print()

   - for (int i = 0 ; i < 2n ; i+=3i)
     for (int j = 0 ; j <i ; j++)
     if (j = target) break;
     else print()

7. The program in below lasts 8 second, when the the input size of the algorithm is 10. What is the working time while problem size is 160, on the same computer?

```
// Input : an integer
// Output : an integer
Function myFun(n)
{
        count = 0
        for i=1 to log n
                for j=i to i+5
                        for k=1 to i*i
                                count = count + 1
        return count
}
```

Note: Do not email your homework or submit it through moodle. Your submissions will be handwritten.

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