

CS 014 Assignment #2

Due on Tuesday 10/24/2017 at the *beginning* of the class

Instructions: Please include the following on the cover page of your assignment:

- Full name
- Student ID
- Your lab section number
- The name of the TA of your lab

Answer the following questions.

1. (10 points) Analyze the following pseudo codes and write down the running time of each one in the Big-Oh notation.

- (a) 1: **function** SUM-A(n)
2: count = 0
3: **for** i = 1 to n **do**
4: **for** j = 1 to n **do**
5: count++
6: **end for**
7: **end for**
8: **end function**
- (b) 1: **function** SUM-B(n)
2: count = 0
3: **for** i = 1 to n **do**
4: **for** j = i to n **do**
5: count++
6: **end for**
7: **end for**
8: **end function**
- (c) 1: **function** SUM-C(n)
2: count = 0
3: **for** i = 1 to n **do**
4: **for** j = i to n **do**
5: **if** i+j is odd **then**
6: count++
7: **end if**
8: **end for**
9: **end for**
10: **end function**
- (d) 1: **function** SUM-D(n)
2: count = 0
3: **for** i = 1 to n **do**

```

4:         for j = i to n do
5:             for k = j to n do
6:                 count++
7:             end for
8:         end for
9:     end for
10: end function
(e) 1: function SUM-E(n)
2:     count = 0
3:     for i = 1 to n do
4:         SUM-A(N)
5:     end for
6: end function

```

2. (5 points) Given a list A of n elements, write a pseudo code for a program that reverses the array in-place. For example, if the input is $A = [9, 11, 5, 4, 1, 0, 13, 5]$, the output should be $[5, 13, 0, 1, 4, 5, 11, 9]$. Analyze the running time of your algorithm using the Big-Oh notation.
3. (5 points) Given the following node struct for a linked list:

```

struct Node {
    int x;
    struct Node* next;
};

```

Write a C function that reverses a linked list given a pointer to its head. Analyze the running time of your function using the Big-Oh notation.

4. (5 points) Given an array A of n Boolean elements, develop an algorithm (pseudo code is fine) that counts the number of runs in the array. A run is a contiguous sequence in the array that is all zeros or all ones. For example, the array $A = [0, 1, 1, 0, 0, 0, 1, 1, 0, 1]$ has six runs. Analyze the asymptotic running time of your algorithm.

Note: This assignment should be done individually. You can either deliver it on iLearn or hand it out at the *beginning* of the class. You can either handwrite it or type it on your favorite word processor. As an acknowledgment for your typing effort, you will get an extra 10% for typing it *neatly* without exceeding 100% of the final grade.