CS3023
Intermediate Programming
Lab 4 A

Name:

Question 1

Consider the following functions. Identify any portions that call for improvements. Rewrite the functions by eliminating the bad parts. You are not giving a new solution. You are just improving the given code.

a. Implementation One

```
def insert(L,x):
    result=[]
    i=0
    if L==[]:
        result+=[x]
        return result
    else:
        while i < len(L):
            if L[i] < x :
                result = L[:i+1] + [x] + L[i+1:]
            i+=1
        return result
```

b. Two

```
def insert(L, X):
    index = 0
    if L:
        if X > L[-1]:
            index = len(L)
        else:
            for i in range(len(L)):
                if L[i] > X:
                    index = i
                    break
        return L[:index] + [X] + L[index:]
    else:
        return [X]
```

c.   three

```
def insert(L, X):
    if L == []:
        return [X]
    i = 0
    while (L[i] < X):
        if (i+1<len(L)):
            i = i+1
        if (i == len(L)-1):
            return L + [X]
    return L[0:i]+[X]+L[i:len(L)]
```

d.   four

```
def insert(L, X):
    answer = []
    if len(L) == 0:
        answer.append(X)
    else:
        for i in range(len(L)):
            if X < L[0]:
                answer = [X] + L
            elif X < L[i]:
                answer = L[0:i-1] + [X] + L[i-1:]
            else:
                answer = L + [X]
    return answer
```

Question 2

Write a *RECURSIVE* insertion sort. The function in_sort accepts an unordered list L of integers and returns a sorted list.

Here's how you approach the problem using recursion.

Recursive Case:

Given [7, 5, 8, 6, 9, 2], recursively sort [5, 8, 6, 9, 2]. You get [2, 5, 6, 8, 9] back from recursion. Now, insert 7 into the ordered list [2, 5, 6, 8, 9]. You get [2, 5, 6, 7, 8, 9]. Return this result to the caller.

Base Case:

Given [ ], you return [ ].

More Hints.

Once level before Base:

Given [2], recursively sort [ ]. You get [ ] back. Insert 2 into [ ], you get [2]. Return [2].

Two levels before Base:

Given [9, 2], recursively sort [2]. You get [2] back. Insert 9 into [2]. You get [2, 9]. Return [2, 9]

Can you implement a clean recursive insertion sort now?