**CSC175 Assignment 6 Spring 2019 Name \_\_\_\_\_\_\_\_\_\_Donald Tvedt\_\_\_\_\_\_\_\_\_\_\_\_\_   
Directions:** Download this file and save as lastnameAssignment6SP19. Type all solutions on this document. Use equation editor when necessary. Upload Word document to Blackboard by **Monday at 11:59 PM.**  
Points in [brackets]. Total: 60 points **Show work** and explain concepts thoroughly!  
[5] points for a professional looking document (directions, organization, neatness, etc.)  
  
1) [8] Use the Euclidean Algorithm to find: (show each step of the algorithm)

a) GDC(693,600)  
b) GCD(1386,880)  
  
  
2) [8] Consider the sorted list: 4 9 11 13 16 18 21 22 23 29 31

a) What is the most steps it could take to find a number if we traveled through the list one at a time? Why?

b) What is the most steps it could take to find a number of we traveled through the list using binary search? Why?

c) Use binary search to find 9. Explain how you used the algorithm.

3) a) [2] Give the Big O runtime for the following algorithm. Explain your answer.

Begin MathAlgorithm (List of numbers A)

Enter N (length of A)  
print N “ is the length of A.”  
M=N\*3  
print M “ is a multiple of 3.”  
If N<5 then  
 print “A has less than 5 elements.”  
Else if N>9  
 print “A has more than 9 elements.”  
Else  
 print “A has between 5 and 9 elements inclusively.”  
W = A[N]\*5  
print W “ is a multiple of 5.”

End MathAlgorithm

b) [4] For the MathAlgorithm above, what would the output be if A = (32, 54, 21, 16, 39, 123, 14, 27)?

c) [2] Give the Big O runtime for the following algorithm. Explain your answer.

Begin Find17Algorithm (List of unsorted numbers A which includes the element 17)

Enter N (length of A)  
Conduct Quick Sort on A  
Conduct Binary Search on A to find element 17

End Find17Algorithm

d) [2] How would the Big O runtime for the Find17Algorithm above change if A was sorted?

e) [2] Give the Big O runtime for the following algorithm. Explain your answer.

Begin InterestingAlgorithm (List of numbers A)

Enter N (length of A)  
For i = 1 to N-1  
For j = i+1 to N  
If A[i]=A[j]  
 print A[i]  
End If  
End For  
End For  
For k = 1 to N  
If A[k]<1 or A[k]>99  
 print A[k] “ is not a valid number.”  
Else  
 print A[k] “ is a valid number.”  
End If  
End For

End InterestingAlgorithm

f) [2] What does the InterestingAlgorithm do? Be as clear as possible.

4) Consider the list 21 11 23 16 13 22 18

a) [5] Use bubble sort to sort the list. Show each swap. How many swaps took place?

b) [7] Explain how merge sort works in your own words. Use merge sort to sort the list. Show each step.

c) [7] Explain how insertion sort works in your own words. Use insertion sort to sort the list. Show each step.

5) [6] Answer each question.

a) What is the best case runtime for insertion sort? When does that occur?

b) What is the worst case runtime for insertion sort? When does that occur?

c) What is Big O notation for merge sort? Generally does it differ from best to worst case runtime? Why do you think that is the case?