Take Home Test 2
CSCI 3394 – Advanced Algorithms

This test consists of several questions that you are to answer and return to me by class time on Thursday. If possible, typed answers are preferred.

1. Using the code given in CLR for both a binary heap and a binomial heap, do a detailed analysis of the number of operations it would require to add n items to the heap and then remove all of those items. (2 points)

2. For this problem I want you to write code that will solve the following problem by searching all of solution space. You are given a graph in which the vertices represent locations in a city, the edges are routes from one location to another and they have the cost (distance) of the route on them. Each vertex is also labeled with the price you would have to pay for gas at that location. You are given a start location, a destination location, a capacity for you gas tank, and a mileage for your car. At each location you can choose to fill your tank or not (no partial filling allowed). You need to return the lowest cost it will take for you to get from your starting point to the destination. (3 points)

3. Are there any ways that you can improve the efficiency of the algorithm you gave above? Do your improvements alter the asymptotic behavior of the algorithm? (1 point)

4. For this problem, I want you to write code that will do binary integer multiplication using the simple elementary school technique and using an efficient divide and conquer technique. For each method, to a detailed analysis of how many "bit additions" you do. So adding two numbers that are n bits long does n "bit additions". Your answer for the regular version will be a closed form. For the divide and conquer algorithm you will get a recurrence that you can simplify as you see fit. (4 points)