Data Structures and Algorithms

Assignment 2

1. Order the following functions by growth rate: N, $N^{1/2}$, $N^{1.5}$, N^2, NlogN, NloglogN, $Nlog^2N$, $Nlog(N^2)$, 2/N, 2^N, $2^{N/2}$, 37, N^2logN, N^3. Indicate which functions grow at the same rate.

2. For each of the following six program fragments:
   a) Give an analysis of the running time (Big-Oh will do).
   b) Implement the code in C, and give the running time for several values of N.
   c) Compare your analysis with the actual running times.

(1) Sum = 0;
for(i = 0; i < N; i++)
Sum ++;
	(2) Sum = 0;
	for(i = 0; i < N; i++)
	for(j = 0; j < N; j++)
	Sum ++;

(3) Sum = 0;
for(i = 0; i < N; i++)
for(j = 0; j < N * N; j++)
Sum ++;
	(4) Sum = 0;
	for(i = 0; i < N; i++)
	for(j = 0; j < i; j++)
	Sum ++;

(5) Sum = 0;
for(i = 0; i < N; i++)
for(j = 0; j < i * i; j++)
for(k = 0; k < j; k++)
Sum ++;
	(6) Sum = 0;
	for(i = 0; i < N; i++)
	for(j = 0; j < i * i; j++)
	if(j % i == 0)
	for(k = 0; k < j; k++)
	Sum ++;

3. Program the 4 algorithms of the maximum sequence sum example.

4. Program Binary Search algorithm with the input data stored in an array.

Due date: Oct. 31st.