CS2984 Fall 2008 Homework Assignment 1
Due Tuesday, September 23 at 11pm
50 points

1. How many steps would you have to take if you walked from McBryde Hall in Blacksburg VA to the Washington Monument in Washington DC?

2. For each of the following pairs of functions, determine whether $f(n)$ is in $O(g(n))$, $g(n)$ is in $O(f(n))$, or $f(n)$ is $\Theta(g(n))$. (Read Section 3.4.5 of the book for help.)

(i) $f(n) = n^2$, $g(n) = n \log n$.

(ii) $f(n) = \log n^2$, $g(n) = (\log n)^2$.

(iii) $f(n) = 2^n$, $g(n) = nlogn$.

(iv) $f(n) = 2^n$, $g(n) = n^n$.

3. Determine Theta for the following code fragments in the average case. Show your work.

i
```
for (i=0; i < n-1; i++)
   for (j=i+1; j < n; j++) {
     tmp = a[i][j];
     a[i][j] = a[j][i];
     a[j][i] = tmp;
   }
```

ii
```
count = 0;
for (i=1; i<=n; i++)
  for (j=1; j<=n; j*=2)
    count++;
```

(iii)
```
count = 0;
for (i=1; i<=n; i*=2)
  for (j=1; j<=n; j++)
    count++;
```

4. Use the space equation of Section 4.1.3 to determine the break-even point for an array-based list and linked list implementation for lists when the sizes for the data field, a pointer, and the array-based list's array are as specified.

1. The data field is eight bytes, a pointer is four bytes, and the array holds twenty elements.
2. The data field is two bytes, a pointer is four bytes, and the array holds thirty elements.
3. The data field is one byte, a pointer is four bytes, and the array holds thirty elements.
4. The data field is 32 bytes, a pointer is four bytes, and the array holds forty elements.

5. Let Q be a non-empty queue, and let S be an empty stack. Using only the stack and queue ADT functions and a single element variable X, write an algorithm (in Java-like pseudocode) to reverse the order of the elements in Q.