COP4530 – Data Structures, Algorithms and Generic Programming
Recitation 5
Date: September 21st and 25th, 2009

Lab topic:
1) Solve practice problems related to complexity analysis
2) Take Quiz

1. Find the computational complexity for the following FOR-loops:
   
   ```
   for (i = (n - 1); i >= 0; i--)
   {
     for (j = 1; j <= i; j++)
     {
       if (numbers[j-1] > numbers[j])
       {
         temp = numbers[j-1];
         numbers[j-1] = numbers[j];
         numbers[j] = temp;
       }
     }
   }
   ```

2. Prove, using induction, that $2n^2 + 3n + 1 < 4n^2$ for all $n > 2$.

3. Assuming that $f_1(n)$ is $O(g_1(n))$ and $f_2(n)$ is $O(g_2(n))$, find a counter example that refutes the following statement:

   $$f_1(n) - f_2(n) \in O(g_1(n) - g_2(n))$$

4. Prove that $n-1$ is big-$\Theta(n)$, directly from the definition of big-Theta.

5. Let $f(n)$ and $g(n)$ be asymptotically non-negative functions. Using the basic definition of big-Theta, show that $\max(f(n), g(n))$ is big-Theta ($f(n) + g(n)$).