

COP4530 – Data Structures, Algorithms and Generic Programming
Recitation 5
Date: February 3rd and 5th, 2009

Lab topic:

- 1) Solve practice problems related to complexity analysis**
- 2) Take Quiz 5**

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:

$$f_1(n) - f_2(n) \text{ is } O(g_1(n) - g_2(n))$$

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 ($f(n) + g(n)$).