CS3210: Assignment 1

May 9, 2017

1. Reorder the following list of function in the descending order of complexity; provide a brief explanation (O) (30 Marks)

1. $2^{\sqrt{logn}}$
2. 2^n
3. $n^{4/3}$
4. $n(logn)^3$
5. n^{logn}
6. 2^{2n}
7. 2^{n^2}

2. Assume $f(n) = O(g(n))$ and $x(n) = O(y(n))$ and $\lg x = \lg_2 x$. Label the following assignments as True/False; prove the true statements and for false statements give at least one example (50 marks)

- $2n \lg n + 100 \lg^2 n = \Theta(n \lg n)$
- $2n \lg n - 100 \lg n + 100 \lg^2 n = \Theta(n \lg n)$
- $\lg_b f(n) = \Theta(\lg f(n))$ for $b > 1$
- $2^{f(n)} = O(2^{g(n)})$
- $f(n) + x(n) = \Theta(g(n) + y(n))$

3. Is the following statement true? If not, provide a condition under which it is true (notice the base of the logarithm) (20 marks):

$$\lg_b f(n) = O(\lg g(n)) \tag{1}$$