CSci 231 Homework 1*

Algorithm Analysis

Reading: KT Chapter 2

1. (KT 2.4) Arrange the following functions in ascending order of growth rate:

$$2^{\sqrt{\log n}}, 2^n, n^{4/3}, n(\log n)^3, n^{\log n}, 2^{2^n}, 2^{n^2}$$

2. KT 2.6

3. KT 2.8

4. Solve the recurrence below. Assume that you know that $\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6}$.

$$T(n) = \begin{cases} 1 & \text{if } n = 1 \\ T(n-1) + n(n-1) & \text{if } n \geq 2 \end{cases}$$

5. Using iteration, find a tight bound for the solution of the following recurrences:

   (a) $T(n) = T(\sqrt{n}) + 1$

   (b) $T(n) = 2T(n/2) + n/\lg n$

   (c) $T(n) = T(n-1) + 1/n$

   (d) $T(n) = 2T(n/4) + \sqrt{n}$

   (e) $T(n) = 5T(n/5) + n/\log n$

6. Using substituion, find a **tight** bound for the solution of the following recurrence:
   $T(n) = 7T(n/2) + n^2$

   For the last two problems (and in general, when solving recurrences): assume T(n) is constant for $n \leq c$, where you can choose c as you need it; and assume that n is a power of 2 or whatever else you need.