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Homework #1: Asymptotics and Sorting
Due Date: Tuesday, 2 July 1996

Reading

Read carefully Ch. 1 and Ch. 2 of CLR.

Practice

Recall, these exercises are purely for your own practice. You need only turn in the official problems.

- Do CLR 1.2-3.
- Do CLR 1.2-6.
- Do CLR 1.4-1.
- Do CLR 2.1-2, 2.1-3.
- Do CLR 2.2-4. [can you do this *without* Stirling's approximation?]

Problems

1. Do CLR 1-2.
2. Do CLR 1.3-6.
3. Do CLR 2-4. [Your proofs must be formal]
4. Rank the following functions by order of growth, *i.e.*, find an arrangement $g_1, g_2, \ldots, g_{25}$ of the functions satisfying $g_1 = \Omega(g_2), g_2 = \Omega(g_3), \ldots,$ $g_{24} = \Omega(g_{25})$. Partition your list into equivalence classes such that $f(n)$ and $g(n)$ are in the same class iff $f(n) = \Theta(g(n))$.

   [Note: We do not require proof for this problem, simply the ordering and the equivalence classes.]

$$\begin{array}{ccccc}
(3/2)^n & (\sqrt{2})^{\lg n} & \lg^* n & n^2 & (\lg n)! \\
n^3 & \lg^2 n & \lg(n!) & 2^{2^n} & n^{1/\lg n} \\
\lg\lg n & n \cdot 2^n & n^{\lg\lg n} & \ln n & 2^n \\
2^{\lg n} & (\lg n)^{\lg n} & 4^{\lg n} & (n+1)! & \sqrt{\lg n} \\
n! & 2^{\sqrt{2\lg n}} & n & n\lg n & 1
\end{array}$$

Extra Credit

Do CLR 1.3-7.