Algorithms and Data Structures

Summer Semester 2025

For discussion on Wednesday, April 30, 2025

1. (GTG Exercise R-3.2) The number of operations executed by algorithms A and B is $8n \log n$ and $2n^2$, respectively. Determine n_0 such that A is better than B for $n \geq n_0$.

2. (GTG Exercise R-3.5) Explain why the plot of the function n^γ is a straight line with slope γ on a log-log scale.

3. (GTG Exercise R-3.6) What is the sum of all the even numbers from 0 to $2n$, for any positive integer n?

4. (GTG Exercise R-3.7) Show that the following two statements are equivalent:

   (a) The running time of algorithm A is always $O(f(n))$.

   (b) In the worst case, the running time of algorithm A is $O(f(n))$.

5. (GTG Exercise R-3.11) Show that if $d(n)$ is $O(f(n))$ and $e(n)$ is $O(g(n))$, then $d(n) + e(n)$ is $O(f(n) + g(n))$.

6. (GTG Exercise R-3.12) Show that if $d(n)$ is $O(f(n))$ and $e(n)$ is $O(g(n))$, then $d(n) - e(n)$ is not necessarily $O(f(n) - g(n))$.