

Chapter 2 Practice Questions

Due Date:

This assignment is due Monday, 2022-09-19 by the beginning of class.

From Chapter 2 of Weiss

Submit complete solutions of the following problems through `learn.unbc.ca`.

- Do Problem 2.1

Order the following functions by growth rate: n , \sqrt{n} , $n^{1.5}$, n^2 , $n \log n$, $n \log(\log n)$, $n(\log n)^2$, $n \log(n^2)$, $2/n$, 2^n , $2^{n/2}$, 37 , $n^2 \log n$, n^3 . (Functions slightly rewritten from text for clarity)

- Do Problem 2.11

An algorithm takes 0.5 ms for input size 100. How long will it take for input size 500 if the running time is the following (assume low-order terms are negligible)?

- linear
- $\Theta(n \log n)$ (Weiss says $O(n \log n)$, but he means $\Theta(n \log n)$. See my September 13 lecture notes on big O.)
- quadratic
- cubic

- Do Problem 2.12

An algorithm takes 0.5 ms for input size 100. How large a problem can be solved in 60s if the running time is the following (assume low-order terms are negligible)?

- linear
- $\Theta(n \log n)$ (you'll need to guesstimate.)
- quadratic
- cubic

- Do Problem 2.25

Programs A and B are analysed and found to have worst-case running times that are no greater than $150n \log n$ and n^2 respectively. Answer the following questions if possible:

- a. Which program has the better guarantee on running times for large values of n $n > 10\,000$?
- b. Which program has the better guarantee on running times for small values of n $n < 100$?
- c. Which program will run faster *on average* for $n = 1000$?
- d. Is it possible that Program B will run faster than Program A on all possible inputs?