

CHAPTER 1 HOMEWORK

Problem 1. Express the function $\frac{n^5}{5} - 10n^4 - \frac{n}{2} + 300$ in terms of O-notation. (0.5p)

Problem 2. Explain why the statement, “The running time of algorithm A is at least $O(n^2)$,” is meaningless. (1p)

Problem 3. Show that: (1.5p)

- a. $f(x) = 2x^2 - x + 30$ is $O(x^2)$
- b. $f(x) = (3x + 2) \log_2(x^2 + 5)$ is $O(x \log_2 x)$
- c. $f(x) = (x^2 + 4 \log_2 x)/(x + 1)$ is $O(x)$

Problem 4. Are following functions $O(x)$? (1)

- a. $f(x) = 10$
- b. $f(x) = 3x + 7$
- c. $f(x) = 2x^2 + 2$

Problem 5. Which one is correct? Explain your answer. (1)

- a. $3^{n+3} = O(3^n)$?
- b. $3^{3n} = O(3^n)$?

Problem 6. Write the algorithms to solve the following problems using C and recursion: (1p)

- a. Count the number of an element x in an array of n integers.
- b. Find the n^{th} Fibonacci number.

Problem 7. In real life applications, what is more important than performance? Explain your answer. (1p)

Problem 8. Give your own ideas to explain why we need to study algorithms and performance. (1p)

Problem 9. Give 1 problem that can be solved using recursion (not the ones that were discussed in class). Write your recursive solution for that problem. (1p)

Problem 10. Rewrite the solution for problem 9 using iteration. (1p)