

Homework Assignments #2

Due: 2020/04/15 12:00

Assessment policy:

- Give full points when correct, $1/n$ for solving each n subproblems. 0 for totally wrong or none, -1 for each errors.
- There may be partial points for proofs if the direction is correct.

1. Apply master theorem (12 pts)

Give tight asymptotic bounds for the following recurrences. (2 pts each)

- a. $T(n) = 2T(n/4) + 1$
- b. $T(n) = 2T(n/4) + \sqrt{n}$
- c. $T(n) = 2T(n/4) + n$
- d. $T(n) = 2T(n/4) + n^2$
- e. $T(n) = T(n/2) + \Theta(1)$
- f. $T(n) = 4T(n/2) + n^2 \lg n$

2. Apply CUT-ROD (5 pts)

For the rod cutting problem, you are given a price table as below.

length i	1	2	3	4	5	6	7	8	9	10
price p_i	1	5	8	9	10	15	15	17	18	21

Apply the EXTENDED-BOTTOM-UP-CUT-ROD procedure, and compute for both tables r and s .

- (a) What is the best revenue you could make with rod of length 6? How should you cut the rod?
- (b) What about for length 10?

3. EXTENDED-MEMOIZED-CUT-ROD (5 pts)

Modify MEMOIZED-CUT-ROD and MEMOIZED-CUT-ROD-AUX to return not only the value but also the actual solutions, as we did for EXTENDED-BOTTOM-UP-CUT-ROD. Write pseudocode for both functions.

4. Apply matrix-chain multiplication (5 pts)

Find an optimal parenthesization of a matrix-chain product whose sequence of dimensions is $\langle 5, 10, 3, 12, 5, 50, 6 \rangle$.