CS 340 - lecture 34 - December 04

Assignment review

- everything from the start of the term onwards is topic of final exam, except: - external sorting
  - parallel algorithms
- do the assignments / textbook problems rather than looking at answer keys only
- don't memorize proofs by heart
- give explanations, write down ideas, partial solutions ⇝ partial marks

A1 P1

$53\, N^3 \cdot \sqrt{N} + 22 N^3 \log(N) + 100 N\sqrt{N} = \Theta(N^3 \cdot \sqrt{N})$

- simplify
- ignore constant factors
- ignore slower-growing summand

A1 P2 - think about what $\Theta$, $O$, $\Omega$, $o$ mean intuitively?

A1 P3 - trick: count number of executions of innermost statement for small values of $n$, e.g. $n = 2, 3, 4, \ldots$
- recall that $1 + 2 + 3 + 4 + \ldots + n = \Theta(n^2)$

A1 P4 to understand $\Theta$ notation, please verify that you understand answer key for (c)

A2 P1 general advice for algorithm design problems:

- what structural properties and/or order properties of the input data can you exploit?
- what data structures might be helpful?

queue, stack, array, tree, adj list, adj. matrix, ...

queue ensure that each node is output exactly once

— at least once is important
— at most once —"—

A2 P2 "gift" question

illustrate an alg. from class

splay trees:
- splay all the way up to the root!
- every insertion is followed by splaying!

A2 P4

- amortized cost calculation

observe how the data changes throughout a sequence of operations, if necessary with an example.

Are "expensive" operations guaranteed to modify the data in a way that some subsequent operations are "cheap"?

A3 P1 gift question

A3 P2 recursively defined structures, like trees, often allow inductive proofs

look for "..." or "and so on" in your arguments ⇝ induction

A3 P3(c) recall routines of code / simple operations, like percolate Down

A4 P1(a) gift

A4 P1(b) recall routines of core operations, merging leftist heaps

A4 P2 recursively defined structure → induction?

A4 P3 unusual question
practise logical reasoning

A4 P4 gift

A5 P1 gift

A5 P4 If Master Theorem needed in exam, I will provide it.

When M. T. works, one only needs to follow a recipe!

A6 P1 gift focus!

A6 P2 gift .. it may help to draw the graph first.

A6 P3 intuitively clear ...
how would you explain this to someone else?
important to understand: (1) and (2) are different statements !!!

A7 P1 gift

A7 P2 → easy to understand when you see answer key.
Would you come up with it, too?

A7 P3 need a core idea
what does the additional information on the input buy you?

A7 P5 gift