

University of Waterloo
CS240E, Winter 2023
Assignment 3 post-mortem

Question 1 [6+6=12 marks]

- A common error was not handling the $i=0$ case properly
- Some did not prove the base case and proceeded directly to the proof
- Q1b was generally done through the bijection technique

Question 2 [8 (+5) = 8 marks]

First, important notes:

- Most solutions to parts (b) and (c) of this problem presented solutions that had issues in either the reasoning or presentation, which are summarized below.
- Parts (b) and (c) were graded as bonus criteria so that submissions are not penalized for the presence of these issues.
- The grading criteria for the bonus question is: +1 for correctly showing the case $k = 2$; +1 or +2 for *attempting* the case of general k (solutions that presented stronger arguments obtained higher credit); +1 for correctly completing the case of general k .

Common errors:

- Claiming that some bound on the height is tight without giving a family of trees that obtains it. In fact, one of the takeaways of the question is to realize that c can be made better with increasing lower bounds on k (see solutions for details).
- Omitting the $1 < h \leq k$ part of the base case in all parts, (a), (b), and (c).
- Many solutions overcomplicated the notation that subtracted from the solutions' readability, for example with unnecessary subscripts upon subscripts, which could be easily avoided (see example solutions for a way to achieve simple notation).
- The organization of writing for this problem should also be improved. Very few solutions to (c) had a clearly presented argument, which obscured the idea of the proof (see the example solution for a way to clearly present the idea).

Question 3 [3+5=8 marks]

- For part 1: Lots of people said that there were n leaves in the decision tree instead of at least n leaves.
- For part 2: Many students gave their algorithm in paragraph form without pseudocode. While some solutions included all the required details to precisely describe the recursion, many didn't. Including pseudocode in questions such as this one is often a good idea.

Question 4 [3 marks]

- Some solutions did not formally treat the base case.