Fundamental Algorithms, Section 003
Homework 5, Additional Problems, Fall 22.

1. Suppose the insertion of item x into a 2-3 tree causes its depth to increase. If the next operation is to delete x, which of the following is true.

a. The depth will not change.

b. The depth must decrease.

c. iii. The depth can decrease, but it does not have to (it depends on the tree).

Justify your answer.

2. Suppose a bank has a collection of accounts, each identified with a (distinct) owner name, and each having a value, namely the balance. The bank wishes to support the following operations:

a. Create an account.

b. Close an account.

c. Add (or subtract) a given sum from the balance for an account identified by the owner's name.

d. Report the account with maximum balance.

e. Report the balance to an owner on request.

Show how to support these operations so they run in time $O(\log n)$, where n is the number of accounts.

3. Suppose you are given a 2–3 tree storing n items. Suppose the next n operations are all insertions. Show that there are $O(n)$ node splittings during these n insertions.