Discrete Mathematics Carsten Schürmann carsten@itu.dk

Homework 9

due *before* class meets.

- 1. Draw the ordered rooted tree corresponding to each of these arithmetic expression written in prefix notation. Then write each expression using infix notation.
 - (a) + * + 5 3 2 1 4
 (b) * + 2 3 5 1
 (c) * / 9 3 + * 2 4 7 6
- 2. Construct the ordered rooted tree whose preorder traversal is a b f c g h i d e j k l where a has four children, c has three children, j has two children b and e have one child each and all other vertices are leaves.
- 3. In this problem we look at the basic operations for a binary search tree. Recall, that a leaf does not carry any data data is only stored inside anode.
 - (a) Define a function *insert* that inserts an element into a binary search tree (that only contains unique elements) at the right place.
 - (b) Define a function *search* that finds an specific element from a binary search tree.
 - (c) Prove by induction the search(n, insert(n, T)) = true.
 - (d) Prove by induction the insert(n, insert(n, T)) = T.
- 4. Find the least integer n such that f(x) is $O(x^n)$ for each of these functions.
 - (a) $f(x) = 2x^3 + x^2 \log x$
 - (b) $f(x) = 3x^3 + (\log x)^4$
 - (c) $f(x) = (x^4 + x^2 + 1)/(x^3 + 1)$
 - (d) $f(x) = (x^4 + 5\log x)/(x^4 + 1)$