

## Monday Homework (due 9am on Wednesday)

### Data Structures (Robert Tarjan)

#### Problem 1 (5 points)

- (a) Give the AVL tree resulting from the insertion of a, b, c, d, e, f, g, h, i, j (in that order) into an initially empty tree.
- (b) Give the red-black tree resulting from the sequence of insertions in (a) into an empty tree.
- (c) Give the splay tree resulting from the sequence of insertions in (a) into an empty tree.

#### **CORRECTED:** Problem 2 (15 points)

- (a) Show that any rank-balanced tree can be converted into a red-black tree by giving each of its nodes a suitable color.
- (b) Give a red-black tree that CANNOT be converted into a rank-balanced tree via any rank assignment to its nodes.

### Large Data Sets (Giuseppe Italiano)

#### Problem 1 (10 points)

If a tree  $T$  is represented as an unordered collection of edges (i.e., the adjacency list representation of  $T$  is not available), what's the I/O complexity of computing an Euler Tour of  $T$ ?

#### Problem 2 (10 points)

Given a tree  $T$ , rooted at a node  $r$ , the depth of a node  $v$  is defined as the number of edges on the path from  $r$  to  $v$  in  $T$ . Design an I/O-efficient algorithm to compute the depth of each node in  $T$ .