1. Consider the problem of finding the distance between the two closest numbers in an array of \( n \) numbers. (The distance between two numbers \( x \) and \( y \) is computed as \(|x - y|\).)

   (a) Design a presorting-based algorithm for solving this problem and determine its efficiency class.

   (b) Compare the efficiency of this algorithm with that of the brute-force algorithm (see problem 9 in Exercises at the end of section 1.2 in the text).

2. For each of the following lists, construct an AVL tree by inserting their elements successively, starting with the empty tree:

   (a) 1, 2, 3, 4, 5, 6
   (b) 6, 5, 4, 3, 2, 1
   (c) 3, 6, 5, 1, 2, 4

3. (a) Design an efficient algorithm for finding and deleting an element of the smallest value in a heap and determine its time efficiency.

   (b) Design an efficient algorithm for finding and deleting an element of a given value \( v \) in a heap \( H \) and determine its time efficiency.

4. Recall that the three main operations on a priority queue are:

   • finding an item with the highest (i.e. largest) priority
   • deleting an item with the highest priority
   • adding a new item to the multi set

   Indicate the time efficiency classes of the three main operations

   (a) an unsorted array
   (b) a sorted array
   (c) a binary search tree
   (d) an AVL tree
   (e) a heap