The worst-case performance of AVL-Tree operations depends primarily on the most adversely structured AVL tree rather than on the operations themselves. Figures 1, 2, and 3 show adversely structured AVL trees of height 2, 3, and 4.

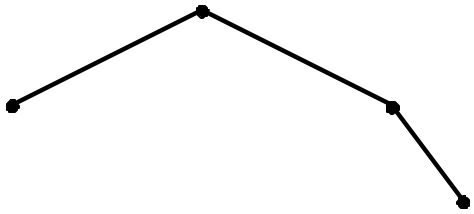

**Figure 1.** Adversely structured AVL tree of height 2.

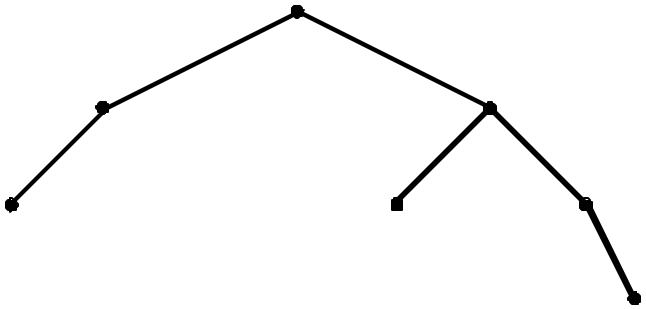

**Figure 2.** Adversely structured AVL tree of height 3.

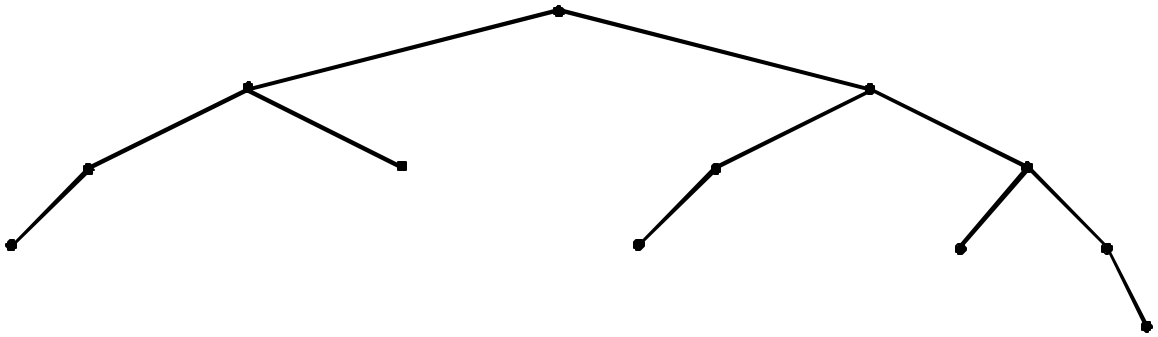

**Figure 3.** Adversely structured AVL tree of height 4.

An adversely structured AVL tree is a tree of height *h* with the minimum number of nodes. Let $S(h)$ be the function that defines the minimum number of nodes in an AVL tree of height *h*. $S(h) = S(h-1) + S(h-2) + 1, S(0) = 1, S(1) = 2.$

The height of an AVL tree is at most roughtly $1.44\log_2(N+2) - 0.328.$ However, the height of most AVL trees is only slightly more than $\log_2 N$.

The time complexity of insertion, removal, and search is equal to the height, *h*, of the AVL tree.