11.1-1.

Suppose that a dynamic set S is represented by a direct-address table T of length m. Describe a procedure that finds the maximum elements of S. What is the worst-case performance of your procedure?

Answer.

As the dynamic set S is represented by the direct-address table T, for each key k in S, there is a slot k in T points to it. If no element with key k in S, then $T[k]$=NIL. Using this property, we can find the maximum element of S by traversing down from the highest slot to seek the first non-NIL one.

MAXIMUM(S)
1   **return** TABLE-MAXIMUM($T, m-1$)

TABLE-MAXIMUM(T, l)
1   **if** $l < 0$
2   **return** NIL
3   **elseif** DIRECT-ADDRESS-SEARCH(T, l) $\neq$ NIL
4   **return** l
5   **else return** TABLE-MAXIMUM($T, l-1$)

The TABLE-MAXIMUM procedure goes down and checks 1 slot at a time, linearly approaches the solution. In the worst case where S is empty, TABLE-MAXIMUM examines m slots. Therefore, the worst-case performance of MAXIMUM is $O(n)$, where n is the number of elements in the set S.