4-1 Give asymptotic upper and lower bounds for \( T(n) \) in each of the following recurrences. Assume that \( T(n) \) is constant for \( n \leq 2 \). Make your bounds as tight as possible, and justify your answers.

(a) \( T(n) = 2T(n/2) + n^3 \).
(b) \( T(n) = T(9n/10) + n \).
(c) \( T(n) = 16T(n/4) + n^2 \).
(d) \( T(n) = 7T(n/3) + n^2 \).
(e) \( T(n) = 7T(n/2) + n^2 \).
(f) \( T(n) = 2T(n/4) + \sqrt{n} \).
(g) \( T(n) = T(n-1) + n \).
(h) \( T(n) = T(\sqrt{n}) + 1 \).

7.1-1 What are the minimum and maximum numbers of elements in a heap of height \( h \)?

7.3-3 Show that there are at most \( \lceil n/2^{h+1} \rceil \) nodes of height \( h \) in any \( n \)-element heap.

7.4-2 What is the running time of heapsort on an array \( A \) of length \( n \) that is already sorted in increasing order? What about decreasing order?