Sorting: Homework

31/3/2020

1. By using the code at:

   `https://github.com/albertocasagrande/AD_sorting`

   implement INSERTION SORT, QUICK SORT, BUBBLE SORT, SELECTION SORT, and HEAP SORT.

2. For each of the implemented algorithm, draw a curve to represent the relation between the input size and the execution-time.

3. Argue about the following statement and answer the questions

   (a) HEAP SORT on a array A whose length is n takes time $O(n)$.

   (b) HEAP SORT on a array A whose length is n takes time $\Omega(n)$.

   (c) What is the worst case complexity for HEAP SORT?

   (d) QUICK SORT on a array A whose length is n takes time $O(n^3)$.

   (e) What is the complexity of QUICK SORT?

   (f) BUBBLE SORT on a array A whose length is n takes time $\Omega(n)$.

   (g) What is the complexity of BUBBLE SORT?

4. Solve the following recursive equation:

$$T(n) = \begin{cases} \Theta(1) & \text{if } n = 32 \\ 3 * T\left(\frac{n}{4}\right) + \Theta\left(n^{3/2}\right) & \text{otherwise} \end{cases}$$