1. (25 Pts.) Problem 3-3 only part “a”, page 58 of text book.

2. (10 Pts.) Show that \( \log n \) is \( O(\sqrt{n}) \) directly from the definition of \( O \)-relation.

3. (15 Pts.) Problem 3-6, page 60 of text book.


5. (15 Pts.) Problem 4-1, page 85 of text book.

6. (20 Pts.) Suppose that instead of sorting a sequence, we just require that elements increase in average. More precisely, we call an \( n \)-element array \( k \)-sorted if, for all \( i = 1, \ldots, n-k \), the following holds:

\[
\frac{\sum_{j=i}^{i+k-1} A[j]}{k} \leq \frac{\sum_{j=i+k}^{i+1} A[j]}{k}
\]

a. What does it mean for an array to be 1-sorted?

b. Prove that \( n \)-element array is \( k \)-sorted if and only if \( A[i] \leq A[i + k] \) for all \( i = 1, \ldots, n-k \).

c. Propose an algorithm that \( k \)-sorts an \( n \)-element array in \( O(n \log(n/k)) \).

7. (Extra Credit) (25 Pts) Problem 4-5, on page 87 of text book.