Take away from last lectures 1 and 2 [1]

1. To find the maximum (or minimum) of n numbers in an array using comparison, we need at least n-1 comparison. Find the reason. It was discussed in the previous class.
2. To find the maximum and minimum of given n numbers in an array using comparison, we need at least (3n/2)-2 comparisons. An algorithm was discussed in the class which finds maximum and minimum using the (3n/2)-2 comparisons. Try to find out the reason for it.
3. To find the maximum and second maximum of given n numbers in an array using comparison, we need at least n-1 + logn- 1 comparisons. Try to find out the reason for it.
4. Given two arrays A and B, both containing n numbers. Find common elements of both arrays and store them in C. This is a straightforward n application of Binary Search. Please look into more applications of Binary search.

Problem for practice:

1. Prove: $5n^2 + 7n + 6 \in \theta(n^2)$.
2. Prove: $4n^2 + 6n - 11 \in \theta(n^2)$.
3. Prove: $6n^3 + 3n^2 - 14n + 2 \in \theta(n^3)$.
4. Prove: $(2n^6 - 4n + 3)^2 \in \theta(n^{12})$.
5. Prove: $\log(3n^2 + n - 5) \in \theta(logn)$.
6. Prove: $n^{sinn} \in O(n)$. Can we prove $\Omega(n)$ for the same function?
7. Prove: $\sum_{i=1}^{n} i^{1/2} = \theta(n^{3/2})$.
8. Prove: $\log(n!) = \theta(n \log n)$
9. Prove: $\sum_{i=1}^{n} i \log i = \theta(n^2 \log n)$.

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