

1994 Paper 13 Question 10

Complexity

For each of the following statements state whether the claim made is true, false or if more information is needed before a judgement can be made. Give one-sentence justifications of your assertions.

- (a) Sorting a list of numbers into ascending order is an NP problem.
- (b) Sorting a collection of programs into order so that the ones that finish quickly come before those that run for a long time is an NP-complete problem.
- (c) To be NP-complete is to be as difficult as any solvable problem can be.
- (d) Any NP problem can be solved (on an ordinary computer) in polynomial space and exponential time.
- (e) The problem of determining whether a k -clique is present in a graph is known to be NP-complete. Therefore for large graphs and large values of k it will always be impossible (in practice) to find such a clique even if it is known that one exists.
- (f) For the purposes of complexity theory each of the cost functions $n \log n$, $n^{1.573}$ and $n!$ counts as polynomial growth.

[20 marks]