



INF2220: algorithms and data structures

Series 9

Topic: Undecidability and Complexity

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Classroom

Exercise 1: Assuming the alphabet $\{0, 1, ', '\}$, what is the formal language that corresponds to the (lexicographic) sorting problem?

Exercise 2: Correct the following statements and give a short explanation

- A formal language is a formal way of speaking a conventional language such as English or Norwegian.
- The Turing machine is a hardware computational device built by Alan Turing.
- By reducing a problem we make it smaller.
- We classify problems into classes based on how important they are.
- Church's thesis is Alonso Church's Ph.D. dissertation.

Exercise 3:

- Show that there are more real numbers than natural numbers, by diagonalization.
- Show how the same technique may be applied to produce an alternative proof that the Halting problem is unsolvable.

Exercise 4: Construct a Turing machine that answers 'yes' (halts scanning a 'Y' on its tape) if its input is a string of one or more 0's; and answers 'no' (N) otherwise. Assume that the input alphabet is $\{0,1\}$.