# Computational Complexity - Scrimmage I

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## 1 Instructions

1. The Scrimmage will not be graded, i.e., there are no points.
2. Attempt as many problems as you can.

## 2 Problems

1. Let $\Sigma = \{0, 1\}$, and let $L \subseteq \Sigma^*$. Show that $(L^*)^* = L^*$.
2. Prove that the set of all functions $N \rightarrow N$ is not countable.
3. Is $N^*$ countable?
4. Design a Turing Machine, that given a number $i$, in binary, outputs $i \ div \ 3$.
5. Show that the Program Termination Problem is undecidable.
6. Prove that every infinite computably enumerable set contains an infinite decidable set.