Homework	8 -	Computer	Science	461
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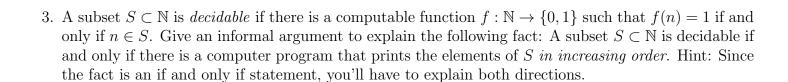
Due Monday, October 23.

1. Prove that if $A,B\subset \Sigma^*$ are both Turing decidable languages, then the intersection $A\cap B$ is also a decidable language.

2. Let $D\subset \Sigma^*$ be a decidable language. Prove that

$$C = \{x \in \Sigma^* : \text{ there exists } y \in \Sigma^* \text{ such that } xy \in D\}$$

is recognizable.



4. Let L be a Turing recognizable language that consists of binary descriptions of Turing machines

$$L = \{ \langle D_0 \rangle, \langle D_1 \rangle, \langle D_2 \rangle, \ldots \},\$$

where every D_i is a decider (assume that every D_i has input alphabet $\Sigma = \{0, 1\}$). Prove that there is a decidable language in $\{0, 1\}^*$ that is not decided by any of the deciders D_i , $i \in \mathbb{N}$. Hint: Use a diagonalization argument on the strings in $\{0, 1\}^*$ to construct a TM N which decides a language L(N) that is different from any of the languages $L(D_i)$.