CSE 6321 - Problem Set 1
Due lecture on February 14th

Collaboration is permitted; looking for solutions from external sources (books, the web, material from previous years, etc.) is prohibited.

1. Give an implementation-level description and a formal description (i.e. including the state diagram of the transition function) of a TM that recognizes

$$\{u\#v : u, v \in \{0,1\}^* \text{ and } u \text{ is } v \text{ reversed}\}$$

2. Show that the collection of decidable languages is closed under concatenation.

   (The concatenation of two languages L, M is the language $\{vw : v \in L, w \in M\}$)

3. * Show that a language is decidable iff there is an enumerator that prints it out in lexicographic order.

4. * Let C be a language. Prove that C is Turing-recognizable iff a decidable language D exists such that $C = \{x : \exists y(\langle x, y\rangle \in D)\}$.

5. Let $T = \{\langle M\rangle : M \text{ is a T.M. that accepts } w \text{ reversed whenever it accepts } w.\}$. Show that T is undecidable.

6. Show that A is Turing-recognizable iff $A \leq_m A_{TM}$.