1. (15%) [Sipser 4.3] Let $ALL_{DFA} = \{ <A> | A \text{ is a DFA that recognizes } \Sigma^* \}$. Show that $ALL_{DFA}$ is decidable.

2. (15%) [Sipser 4.5] Let $INFINITE_{DFA} = \{ <A> | A \text{ is a DFA and } L(A) \text{ is an infinite language} \}$. Show that $INFINITE_{DFA}$ is decidable.

3. (15%) [Sipser 5.4] If $A \leq_m B$ and $B$ is a regular language, does that imply that $A$ is a regular language? Why or why not?

4. (15%) [Sipser 5.6] Show that $\leq_m$ is a transitive relation.

5. (10%) [Sipser 7.1] Answer each part TRUE or FALSE.
   a. $2^n = O(n)$.
   b. $n^2 = O(n)$.
   c. $n^2 = O(n \log^2 n)$.
   d. $n \log n = O(n^2)$.
   e. $3^n = 2^O(n)$.

6. (15%) [Sipser 7.6] Show that $P$ is closed under union, concatenation and complement.

7. (15%) [Sipser 7.11] Call graphs $G$ and $H$ isomorphic if the nodes of $G$ may be reordered so that it is identical to $H$. Let $ISO = \{ <G, H> | G \text{ and } H \text{ are isomorphic graphs} \}$. Show that $ISO \in NP$. 