1. (20%) Do *slowly* and *lovely* share a morpheme? Why? Why not?

2. (30%) State as true or false:

   (a) $\{\varepsilon\}^* = \{\varepsilon\}$

   (b) $\emptyset^* = \{\varepsilon\}$

   (c) For any alphabet Σ, any L defined over Σ is such that $L \in \mathscr{P}(\Sigma^*)$. ($\mathscr{P}(X)$ denotes the power set of X.)

   (d) For any language L, $\emptyset L = L\emptyset = L$

   (e) For any language L, $\{\varepsilon\}L = \emptyset$

   (f) $abcd \in (a(cd)^*b)^*$

3. (25%) Give a regular expression for the set of strings over the alphabet $\{0,1,2\}$ such that every 0 is followed by exactly two 1's and every 2 is followed either by 10 or 01.

4. (25%) Give a regular expression for the set of strings over $\{a,b\}$ with exactly one occurrence of the string *aaa*. (Hint: the rule does NOT say possible *a*'s in a string are limited to that one occurrence of *aaa*.)