#1. (11 Points) Prove that the following is not a regular language: The set of strings of 0’s and 1’s that are of the form \( w w \)

#2. (10 Points) Show that the language \( L = \{a^p\} \) p is prime is not a regular language

#3. (9 Points) Suppose \( h \) is the homomorphism from \( \{0,1,2\} \) to \( \{a,b\} \) defined by \( h(0) = a; \ h(1) = ab; \ h(2) = ba \).
   a) What is \( h(21120) \)
   b) If \( L = 01*2 \), what is \( h(L) \)?
   c) If \( L = a(ba)* \), what is \( h^{-1}(L) \)?

#4. (20 Points) a) Show that the question: \( Does \ \ L = S*? \) for regular language \( L \) is decidable.
   b) Show that the question, \( Given \ \ a \ \ FA \ M \ over \ \ \Sigma, \ does \ \ M \ \ accept \ \ a \ \ string \ \ of \ \ length \ \ \leq \ \ 2? \) is decidable

#5. (Best answers will be posted to the bb) What is a CS or real world application of dfa state minimization?