Homework #3: Chapters 7 and 8

The following exercises are due at the beginning of class on Friday, February 24.

1. *[20 pts.]* Do exercise 7.8 (a,b,c,d, and g) from the book (p. 237). Show your work.

2. *[20 pts. total]* Consider a knowledge base *KB* that contains the following propositional logic sentences:

$$Q \Rightarrow P$$
$$P \Rightarrow \neg Q$$
$$Q \vee R$$

   a) *[5 pts.]* Construct a truth table that shows the truth value of each sentence in *KB* and indicate the models in which the *KB* is true.
   b) *[5 pts.]* Does *KB* entail *R*? Use the definition of entailment to justify your answer.
   c) *[5 pts.]* Does *KB* entail $R \Rightarrow P$? Extend the truth table and use the definition of entailment to justify your answer.
   d) *[5 pts.]* Does *KB* entail $Q \Rightarrow R$? Extend the truth table and use the definition of entailment to justify your answer.

3. *[50 pts.]* Do exercise 8.6 (a - j) from the book (p. 268). Use the following constants and predicates (and no others):

   - *F*: a constant representing French
   - *G*: a constant representing Greek
   - *S*: a constant representing Spring 2001
   - *UK*: a constant representing the U.K.
   - *Agent(x)*: *x* is an agent
   - *Barber(x)*: *x* is a barber
   - *Expensive(x)*: *x* is expensive
   - *Insured(x)*: *x* is insured
   - *LocalMan(x)*: *x* is a man living in the town
   - *Person(x)*: *x* is a person
   - *Policy(x)*: *x* is a policy
   - *Smart(x)*: *x* is smart
   - *Student(x)*: *x* is a student
   - *BestScore(c,s)*: *s* is the best score in course *c*
   - *BornIn(x,c)*: person *x* is born in country *c*

   - *Buys(x,y)*: person *x* buys item *y*
   - *CitizenByBirth(x,c)*: person *x* is a citizen by birth in country *c*
   - *CitizenByDescent(x,c)*: person *x* is a citizen by descent in country *c*
   - *CitizenOf(x,c)*: person *x* is a citizen of country *c*
   - *GreaterThan(x,y)*: $x > y$. You may assume that the standard mathematical semantics apply to this predicate.
   - *Parent(x,y)*: person *x* has parent *y*
   - *Passes(x,c)*: student *x* passes course *c*
   - *ResidentOf(x,c)*: person *x* is a resident of country *c*
   - *Sells(s,x,b)*: person *s* sells item *x* to person *b*
   - *Shaves(x,y)*: person *x* shaves person *y*
   - *TakesCourse(x,c,s)*: student *x* takes course *c* in semester *s*

4. *[10 pts.]* Do exercise 8.16 from the book (p. 270). Your axiom should be consistent with those defined on pages 258-260. You may also use any predicates already defined for the Wumpus world.