Homework #3: Chapters 7 and 8

The following exercises are due at the beginning of class on Friday, February 29.

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:

\[
Q \Rightarrow P \\
P \Rightarrow \neg Q \\
Q \lor R
\]

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 \( \neg Q \)? Use the definition of entailment to justify your answer.
c) [5 pts.] Does \( KB \) entail \( P \Rightarrow R \)? Extend the truth table and use the definition of entailment to justify your answer.
d) [5 pts.] Does \( KB \) entail \( P \lor Q \)? 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.