Theoretical Exercise 3

The Hebrew University of Jerusalem Introduction to Artificial Intelligence

due date 2.6.20

Logic Syntax [40 points]

Question 1:

A. Translate the following sentences into propositional logic.
   a.   If Jane and John are not in town we will play tennis
   b.   It will either rain today or it will be dry today
   c.   You will not pass this course unless you study

B. Write the following sentences in FOL
   a.   For every action, there is an equal and opposite reaction.
   b.   Everyone loves someone who loves everyone.
   c.   We are living in a green earth.

C. Translate the following lines into English.

   a. $\neg(Live \land (You \lor \neg You))$
   b. $Own(You, \ Earth) \lor \{\forall c \ [Color(c, Wind) \land canPaintWith(You, \ c) \land Own(You, \ TheEarth)]\}$

Most general unifier [15 points]

Question 2:

Determine whether the members of each of the following pairs of
expressions
unify with each other. If so, find the most general unifier (MGU); If
not, give
a brief explanation.
Note - free variables are assumed to be universally quantified.

   a. Color (Hat(Postman), Blue)

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    Color (Hat(y),x)

 b. R (F(y),y,x)
    R(x,F(A),F(v))

 c. Loves (x,y)
    Loves (y,x)
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Resolution

Question 1: [15 points]

Athos, Aramis and Porthos belong to the Hoofers Club. Every member of the Hoofers Club is either a skier or a mountain climber or both. No mountain climber likes rain, and all skiers like snow. Porthos dislikes whatever Athos likes, and likes whatever Athos dislikes. Athos likes rain and snow.
Use resolution with one or more heuristics to find whether there is a member of the Hoofers Club who is a mountain climber but not a skier. Specify what kind of heuristics you used during the process of resolution.

Question 2: [30 points]

From "Horses are animals," it follows that "The head of a horse is the head of an animal." Demonstrate that this inference is valid by carrying out the following steps:
   a. Translate the premise and the conclusion into the language of first-order logic. Use three predicates: HeadOf(h, x)(meaning "h is the head of x"), Horse(x), and Animal(x).
   b. Negate the conclusion, and convert the premise and the negated conclusion into conjunctive normal form.
   c. Use resolution to show that the conclusion follows from the premise