Chapter 8: FOL

[1] Write the BNF for FOL

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[2] Write FOL sentences to define the class domain
Hint: define *Student*, *Friend*, *Teacher*, …..

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[3] Write FOL sentences to define the domain of sets

Hint : *EmptySet* is a constant written {}; *Member* and *Subset* are predicates written $x \in s1$, $s1 \subseteq s2$; and *Intersection*, *Union*, and *Adjoin* are functions written $s1 \cap s2$, $s1 \cup s2$, $\{x \mid s\}$.

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[4] Define the following terms

i. Substitution
ii. Universal Instantiation
iii. Existential Instantiation
iv. Existential Introduction
v. Generalized Modus Ponens
vi. Unification (UNIFY function)
vii. COMPOSE function
viii. Skolemization
ix. FOL Resolution

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[5] "I married a widow (let's call her W) who has a grown-up daughter (D). My father (F) fell in love with my step-daughter and married her. Hence, my father became my son-in-law and my step-daughter became my mother. Some months later my wife gave birth to a son (S1) and the wife of my father also had a son (S2)"

i. Using predicate logic, create a set of expressions that represent the situation in the above story. Add expressions to define basic family relationships such as father-in-law.

ii. Use modus-ponens on this system to prove the conclusion that "I am my own grandfather".

[6] Give the algorithm for Unification

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[7] If we know that: "*The law says that it is a crime for an American to sell weapons to hostile nations. The country Nono, an enemy of America, has some missiles, and all of its missiles were sold to it by Colonel West, who is American*."

And we wish to prove that West is a criminal

Represent these facts in first-order logic, and then show the proof using :

1. Forward chaining
2. Resolution

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