ASSIGNMENT 6

Resolution qUESTION

(a) Marcus was a man.
(b) Marcus was a Roman.
(c) All men are people.
(d) Caesar was a ruler.
(e) All Romans were either loyal to Caesar or hated him (or both).
(f) Everyone is loyal to someone.
(g) People only try to assassinate rulers they are not loyal to.
(h) Marcus tried to assassinate Caesar

qUERY::::::::::::::::

Who hated Caesar?

First order logic

(a) Marcus was a man. => $M(Marcus)$
(b) Marcus was a Roman. => $R(Marcus)$
(c) All men are people. => $\forall x\ (M(x) \rightarrow P(x))$
(d) Caesar was a ruler. => $Ruler(Caesar)$
(e) All Romans were either loyal to Caesar or hated him (or both). => $\forall x\ R(x) \rightarrow Layal(x, Caesar) \lor Hated(x, Caesar)$
(f) Everyone is loyal to someone. => $\forall x \exists y\ Layal(x, y)$
(g) People only try to assassinate rulers they are not loyal to. $\forall x$ => $\forall x \forall y (Assassinate(x, y) \rightarrow \neg Layal(x, y)$
(h) Marcus tried to assassinate Caesar => $Assassinate(Marcus, Caesar)$

Now,
Let $\neg$ Hated(Marcus, Caesar)

$Layal(x, Caesar) \lor Hated(x, Caesar)$ $\qquad$ $\neg$ Hated(Marcus, Caesar)

Layal(Marcus, Caesar)

Assassinate(Marcus, Caesar) $\neg$ Assassinate(Marcus, Caesar)

Contradiction

So, Marcus hates Caesar.

Q. Consider the following paragraph:
"anything anyone eats are called food. Milka likes all kind of food. Bread is a food. Mango is a food. Alka eats pizza. Alka eats everything milka eats."
Translate the following sentences into (WFF) in predicate logic and then into set of clauses. Using resolution principle answer the following:

1. Does Milka like pizza?
2. what food Alka eats[Question answering]

1. Anything anyone eats are called food

$\forall x: \forall y: eats(x, y) \rightarrow food(y)$

$\forall x: \forall y: \neg eats(x, y) \vee food(y)$

$\Rightarrow \neg eats(x, y) \vee food(y)$

2. Milka likes all kind of food

$\forall y1: Food(y1) \rightarrow like(Milka, y1)$

$\forall y1: \neg Food(y1) \vee like(Milka, y1)$

$\Rightarrow \neg Food(y1) \vee like(Milka, y1)$

3. Bread is a food

$\Rightarrow food(Bread)$

4. Mango is a food

$\Rightarrow food(Mango)$

5. Alka eats pizza

$\Rightarrow eats(Alka, pizza)$

6. Alka eats everything milka eats

$\forall x: \forall y: eats(Milka, x1) \rightarrow eats(Alka, x1)$

$\forall x: \forall y: \neg eats(Milka, x1) \vee eats(Alka, x1)$

$\Rightarrow \neg eats(Milka, x1) \vee eats(Alka, x1)$

i> Does Milka like pizza?

Assume, Milka doesn't like pizza

$\neg like(Milka, pizza)$

$\neg like(Milka, pizza)$ $\quad$ $\neg food(y) \vee like(Milka, y1)$

$eats(x, y) \vee food(y)$ $\quad$ $\neg food(pizza)$

$eats(Alka, pizza)$ $\quad$ $\neg eats(x, pizza)$

Failed assumption

Since $\neg like(Milka, pizza)$ is contradiction
$like(Milka, pizza)$ is true.

2. What food Alka eats

$\exists x: eats(Alka, x)$

Assume: Alka doesn't eats anything

$\neg (\exists x2: eats(Alka, x2))$

$\forall x2: \neg eats(Alka, x2)$

$\Rightarrow \neg eats(Alka, x2)$

$\neg eats(Alka, x2)$ $\quad$ $eats(Alka, pizza)$

Assumption failed

So, Alka eats anything is true, Alka eats pizza.

Q. Consider the following axioms:

1. Every child loves Santa.

Represent these axioms in predicate calculus; skolemize as necessary and convert each formula to clause form. (Note: `has a red nose' can be a single predicate. Remember to negate the conclusion.) Prove the unsatisfiability of the set of clauses by resolution.

1. Every child loves Santa.

$\forall x(child,\ x) \rightarrow love(x,\ Santa) \Rightarrow \neg\ child(x) \lor love(x,\ Santa)$

2. Everyone who loves Santa loves any reindeer.

$\forall x(love(x,\ Santa)) \rightarrow \forall y(reindeer(y)) \rightarrow love(x,\ y)$

$\Rightarrow \neg\ love(x,\ Santa) \lor (\neg\ reindeer(y) \lor love(x,\ y))$

3. Rudolph is a reindeer, and Rudolph has a red nose.

$reindeer(Rudolph) \land rednose(Rudolph)$

4. Anything which has a red nose is weird or is a clown.

$\forall x\ (rednose(x) \rightarrow weird(x) \lor clown(x))$ $\qquad \neg\ rednose(x) \lor (weird(x),\ clown(x))$

5. No reindeer is a clown.

$\neg\ \exists x\ (reindeer(x) \land clown(x))$ $\qquad \neg\ reindeer(x) \lor \neg\ clown(x)$

6. Scrooge does not love anything which is weird.

$\forall x\ (weird(x) \rightarrow \neg\ love(Scrooge,\ x)$ $\qquad \neg\ weird(x) \lor \neg\ love(Scrooge,\ x)$

7. (Conclusion) Scrooge is not a child.

$\neg\ child(Scrooge)$ $\qquad \neg\ child(Scrooge)$

$\neg\ child(x) \lor love(x,\ Santa)$ $\qquad \neg\ child(Scrooge)$

So, let: $\neg\ child(x)$: $love(Scrooge,\ Santa)$

$\neg\ love(x,\ Santa) \lor (\neg\ reindeer(y) \lor love(x,\ y))$ $\qquad love(Scrooge,\ Santa)$

$\neg\ reindeer(y) \lor love(Scrooge,\ y)$

$\neg\ reindeer(x) \lor clown(x)$ $\qquad reindeer(Rudolph)$

$\neg\ clown(Rudolph)$

$\neg\ weird(r) \lor \neg\ love(Scrooge,\ r)$ $\qquad weird(Rudolph)$

$\neg\ love(Scrooge,\ Rudolph)$

$\neg\ clown(Rudolph)$ $\qquad \neg\ love(Scrooge,\ Rudolph)$

$\neg\ clown(Rudolph)$

Contradiction

Hense, The set of clauses are unsatisfied.