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ECE 448

HW2

Problem 1

a.) It is an atom, a literal, and a WFF.
Because it has a predicate of terms x and y, and is not negated or has any conjunctions.

b.) It is a term.
Because h is a function of terms and the output of a function is a term.

c.) It is a WFF.
Because it has a predicate with quantifiers.

d.) It is nothing.
Because a term cannot be negated.

e.) It is a WFF.
Because it is a negated literal, so it's not a literal, and not an atom because it is negated.

f.) It is a WFF.
Because it has predicates with logical connectives.

Problem 2

a.) $\forall x[Man(x) \Rightarrow Die(x)]$

b.) $\forall x[Lannister(x) \Rightarrow Pays\_Debts(x)]$

c.) $\exists x[\neg John(x) \wedge Likes(John, Mary) \wedge Likes(Mary, x)]$

d.) $\forall x \exists y[Student(x) \wedge Homework(y) \Rightarrow Does(x, y)] \wedge$
$\exists a \forall b[Student(a) \wedge Homework(b) \Rightarrow Does(a, b)]$

Problem 3

a.) All students or at least one student is a CS major.
(This is true in our world currently)

b.) All integers are odd and are positive
(This is false in our world obviously)

c.) Every man is a person
(This is also true in our world)

Problem 4

False, if x = -3, the conditions of the if statement are true but the outcome of the if statement is false.

Problem 5

It is impossible to say whether or not I will get her autograph, it is also impossible to say whether or not I will get a selfie with her. My statement to her was basically you won't do this in a world where you won't do this, and you will do this in a world where you will. This is basically a disjunction introduction. I was just telling her a statement that is inherently true and not meaningful and she agrees with. She is agreeing to that a true statement is true, but not a giving me an autograph, and therefore not to taking a selfie with me. But she also doesn't decline an autograph or selfie so it is therefore impossible to say.

Problem 6

a.) MGU: $\{x = f(a,a),\ y = x,\ \ z = y\}$

Unification instance: $p(f(a,a),\ f(a,a),\ f(a,a))$

b.) This is not unifiable since they have a different number of terms.

c.) MGU: $\{a = x,\ y = f(a,u),\ u = g(z,b)\}$

Unification instance: $p(x,\ f(x,g(z,b)),\ g(z,b))$

d.) MGU: $\{z = g(a,x),\ x = g(a,y),\ y = a,\ b = u\}$

Unification instance: $p(g(a,a),\ f(g(a,g(a,a)),g(a,g(a,a))),\ f(u,a))$

Problem 7

a.)

Table(Tbl)
Peg(P0)
Peg(P1)
Peg(P2)
Disk(D0)
Disk(D1)
Disk(D2)
Bigger(D0,D1)
Bigger(D1,D2)
On(D0,P0)
On(D1,P0)
On(D2,P0)
Supports(Tbl,D0)
Supports(D0,D1)
Supports(D1,D2)
Clear(D2)
Empty(P1)
Empty(P2)

b.) 4 operators

One to move disk onto the table when not on table, one to move disk onto disk when not on the table, one to move disk onto the table when on table, and one to move disk onto disk when on the table

c.) MoveBottomToTable(u,v): move a disk that's on the table to a specified empty peg

PC: Disk(u), Peg(v), Clear(u), Empty(x), On(u,y), Supports(t,u), Table(t)
Effects: ¬On(u,y), Empty(y), On(u,v), ¬Empty(v)