

Logic for Applications

Ch 9 # 5

Ch 10 # 1

ch 11 #1, 2, 3

Ch 9

5.

(a)

$Ay(Exp(x,y) \rightarrow Q(y,z)) \ \& \ Ey(AxR(x,y) \mid Q(x,y))$
 $EaAy(Exp(x,y) \rightarrow Q(y,z)) \ \& \ (AxR(x,a) \mid Q(x,a))$
 $AbEa[Ay(Exp(x,y) \rightarrow Q(y,z)) \ \& \ (R(x,a) \mid Q(b,a))]$
 $AbEa[AyAc(P(c,y) \rightarrow Q(d,z)) \ \& \ (R(x,a) \mid Q(b,a))]$
 $AbEaAd[Ac(P(c,d) \rightarrow Q(d,z)) \ \& \ (R(x,a) \mid Q(b,a))]$
 $AbEaAdAe[(P(e,d) \rightarrow Q(d,z)) \ \& \ (R(x,a) \mid Q(b,a))]$
 $AbAdAe[(P(e,d) \rightarrow Q(d,z)) \ \& \ (R(b,f(a)) \mid Q(b,a))]$

Ch 10

1.

(a).

{c,R}

(b).

 $\{c^A = c, R(x)^A = R(x)\}$

(c).

We can only substitute $R(c)$ for $Ex\sim R(x)$ to get $\{R(c), \sim R(c)\}$ which is invalid (there is no model)

Ch 11.

1

(a)

$S0 = \{P(x,f(y),z), P(g(a),f(w),u), P(v,f(b),c)\}$
 $D1 = \{x, g(a), v\}$
 $s1 = \{x/g(a), v/g(a)\}$
 $S1 = \{P(g(a),f(y),z), P(g(a),f(w),u), P(g(a),f(b),c)\}$
 $D2 = \{y, w, b\}$
 $s2 = \{w/y, b/y\}$
 $S2 = \{P(g(a),f(y),z), P(g(a),f(y),u), P(g(a),f(y),c)\}$
 $D3 = \{z,u,c\}$
 $s3 = \{u/z, c/z\}$
 $S3 = \{P(g(a),f(y),z), P(g(a),f(y),z), P(g(a),f(y),z)\}$

2.

I am assuming that a and c are supposed to be constants rather than variables, so they can't unify with each other. For the same reason, a can't unify with $f(x)$, but it could if it were a variable rather than a constant.

3.

Let us take the predicate $R(a,b,c)$. Let substitution $s=\{a/c\}$ and $t=\{c/q\}$. Then, $R(a,b,c)_s = R(q,b,q)$ and $R(a,b,c)_{ts} = R(c,b,q)$