append(c(A,X),Y,c(A,Z)) :- append(X,Y,Z). (1)

append(nil,Z,Z). (2)

Query: ?append(F,c(L,nil),c(l,c(i,c(s,c(t,nil)))))

yes(F,L) :- append(F, c(L,nil), c(l,c(i,c(s,c(t,nil))))).

resolved append(c(A1,X1), Y1, c(A1,Z1)):- append(X1,Y1,Z1).

{F/c(A1,X1), Y1/c(L,nil), A1/l, Z/c(i,c(s,c(t,nil)))}

yes(c(A1,X1),L):- append(A1,c(L,nil), c(i,c(s,c(t,nil)))).

resolve with append(c(A2,X2), Y2, c(A2,Z2)):- append(X2,Y2,Z2).

{X1/c(i,X2),Y2/c(L,nil),A2/i,Z2/c(s,c(t,nil))}

yes(c(l,c(i,X2)),L):-append(X2,c(L,nil),c(s,c(t,nil)))

append(c(A,X),Y,c(A,Z)) :- append(X,Y,Z). (1)

append(nil,Z,Z). (2)

yes(c(l,c(i,X2)),L):-append(X2,c(L,nil),c(s,c(t,nil)))

resolved with a copy of (1)

append(c(A3,X3),Y3,c(A3,Z3)) :- append(X3,Y3,Z3).

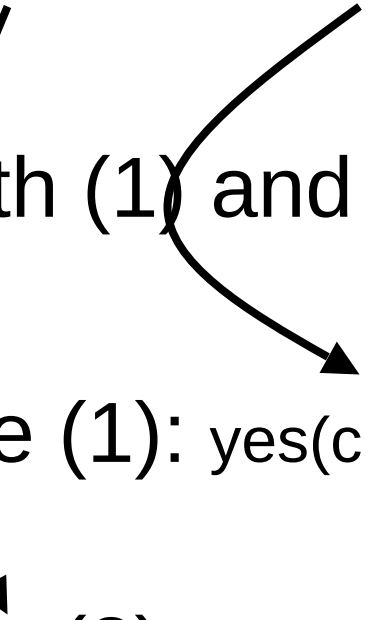
{X2/c(s,X3), Y3/c(L,nil), A3/s, Z3/c(t,nil)}

yes(c(l,c(i,c(s,X3))),L):-append(X3,c(L,nil),c(t,nil)).

append(c(A,X),Y,c(A,Z)) :- append(X,Y,Z). (1)

append(nil,Z,Z). (2)

yes(c(l,c(i,c(s,X3))),L):-append(X3,c(L,nil),c(t,nil)).



Both (1) and (2) can be used to resolve the body.

Use (1): yes(c(l,c(i,c(s,X3))),L):- append(X4,c(L,nil),nil). FAIL

Use (2): yes(c(l,c(i,c(s,nil))),t) :- SUCCESS

Exercise 2.7

```
i_west(r101,r103). (1)
i_west(r103,r105). (2)
i_west(r105,r107). (3)
i_west(r107,r109). (4)
i_west(r109,r111). (5)
i_west(r131,r129). (6)
i_west(r129,r127). (7)
i_west(r127,r125). (8)

i_east(R1,R2):-
    i_west(R2,R1).  (9)
```

```
next_door(R1,R2):- i_east(R1,R2).(10)
next_door(R1,R2):- i_west(R1,R2).(11)

two_doors_east(R1,R2) :-
    i_east(R1,R), i_east(R,R2).        (12)

west(R1,R2) :-    i_west(R1,R2).    (13)
west(R1,R2) :-    i_west(R1,R),
                  west(R,R2).       (14)
```

Query: ? two_doors_east(r107,R)

yes(R) :- two_doors_east(r107,R).

answer clause

resolved with a copy of (12)

two_doors_east(R1,R2) :- i_east(R1,R3), i_east(R3,R2).

substitution {R1/r107,R/R2}

yes(R2) :- i_east(r107,R3), i_east(R3,R2).

take i_east(r107,R3)

resolved with a copy of (9)

i_east(R1,R4):-i_west(R4,R1).

substitution {R1/r107,R3/R4}

yes(R2) :- i_west(R4, r107), i_east(R4,R2).

yes(R2) :- i_west(R4, r107), i_east(R4,R2).

take i_west(R4,r107)

resolved with a copy of (3)

i_west(r105,r107).

substitution {R4/105}

yes(R2) :- i_east(r105,R2).

resolved with a copy of (9)

i_east(R1,R4):-i_west(R4,R1).

substitution {R1/r105,R2/R4}

yes(R4) :- i_west(R4, r105).

yes(R4) :- i_west(R4, r105).

resolved with a copy of (2)

i_west(r103,r105).

substitution {R4/r103}

yes(r103) :- SUCCESS

The answer is R = 103

More precisely: two_doors_east(r107,r103)

Exercise 2.11

q(Y):- s(Y,Z), r(Z).
p(X):- q(f(X)).
s(f(a), b).
s(f(b), b).
s(c, b).
r(b).
Find all ground atomic logical consequences of the program.

Difficulty: Function symbol ?

Query: ?q(Y)

yes(Y):- q(Y).

yes(Y):- s(Y,Z), r(Z).

case 1: s(f(a),b) => yes(f(a)):-r(b). [SUCCESS]

case 2: s(f(b),b) => yes(f(b)):-r(b). [SUCCESS]

case 1: s(c,b) => yes(c):-r(b). [SUCCESS]

Thus: three answers for ?q(Y) : q(f(a)), q(f(b)), q(c)

Query: ?p(Y)

yes(Y):- p(Y).

yes(Y):- q(f(Y)).

continues as before

case 1: yes(a):-q(f(a)). [SUCCESS]

case 2: yes(b):-q(f(b)). [SUCCESS]

case 1: yes(c):-q(f(c)). [FAIL]

Thus: two answers for ?p(Y) : p(a), p(b)

For other queries we have only facts as answer.

Final answer: {q(f(a)), q(f(b)), q(c), p(a), p(b),
r(b), s(f(a),b), s(f(b),b), s(c,b)}