Übungen zur Vorlesung: Wissensbasierte Systeme

Blatt 1

Exercise 1.1:
Given the knowledge base:
a <- b ∧ c.
a <- e ∧ f.
b <- d.
b <- f ∧ h.
c <- e.
d <- h.
e.
f <- g.
g <- c.

a) Give a model of the knowledge base.
b) Give an interpretation that is not a model of the knowledge base.
c) Give two atoms that are logical consequences of the knowledge base.
d) Give two atoms that are not logical consequences of the knowledge base

Exercise 1.2:
Consider the language that contains the constant symbols *a, b*, and *c*; the predicate symbols *p* and *q;* and no function symbols. We might also have the following knowledge bases built from this language:

KB_1 = { *p*(*a*) }.

KB_2 = { *p*(*X*) <- *q*(*X*) }.

KB_3 = { *p*(*X*) <- *q*(*X*),
p(a),
q(b) }.

Now consider possible interpretations for this language of the form $I = (D, \pi, \phi)$, where *D* consists of exactly four domain elements, *w, x, y*, and *z*.

(a) How many interpretations with the four domain elements exist for our simple language? Give a brief justification for your answer. Hint: Consider how many possible assignments ϕ exist for the constant symbols, and consider how many extensions predicates *p* and *q* can have to determine how many assignments π exist. Don't try to enumerate all possible interpretations.
(b) Of the interpretations outlined above, how many are models of KB_1? Give a brief justification for your answer.
(c) Of the interpretations outlined above, how many are models of KB_2? Give a brief justification for your answer.
(d) Of the interpretations outlined above, how many are of KB_3? Give a brief justification for your answer.

Exercise 1.3:
Given the knowledge base *KB* containing the clauses:

a <- b ∧ c.
b <- d.
b <- e.
c.
d <- h.
e.
f <- g ∧ b.
g <- c ∧ k.
j <- a ∧ b.

(a) Show how the bottom-up proof procedure works for this example. Give all logical consequences of *KB*.
(b) *f* isn't a logical consequence of *KB*. Give a model of *KB* in which *f* is false.
(c) *a* is a logical consequence of *KB*. Give a top-down derivation for the query ?*a*.