Foundations of Logic Programming
Tutorial 5 (on December 20th)

Lukas Schweizer

WS 2019/20

Exercise 5.1:
Consider the following program $\mathcal{P}$:

```
p(X,X,c).
p(f(X),Y,f(Z)) :- p(X,Y,Z).
```

a) Indicate the Herbrand universe HU_F and the Herbrand base $HB_{\Pi,F}$ determined by $\mathcal{P}$.

b) Give the least Herbrand model $\mathcal{I}_1$ of $\mathcal{P}$.

c) Give a Herbrand model $\mathcal{I}_2$ of $\mathcal{P}$, different from $\mathcal{I}_1$.

d) Give a classical model model $\mathcal{I}_3$ of $\mathcal{P}$, different from $\mathcal{I}_1$ and $\mathcal{I}_2$.

Exercise 5.2:
Take the following program P:

$$p \leftarrow .$$
$$p \leftarrow p.$$
$$q \leftarrow r.$$
$$q \leftarrow \neg r,\ p.$$
$$r \leftarrow \neg p.$$
$$t \leftarrow q.$$
$$t \leftarrow r, \neg q.$$

a) Construct the dependency graph D_P of P.

b) Is P *stratified* and/or *hierarchical*?

c) Give a stratification of P.

d) Use the stratification to show how to compute the standard model M_P of P.

Exercise 5.3

Consider the following program:

$$p(a). \tag{1}$$
$$p(b). \tag{2}$$
$$r(b). \tag{3}$$
$$p(c). \tag{4}$$
$$p(d). \tag{5}$$
$$r(d). \tag{6}$$
$$naf(X) \leftarrow X,!,fail. \tag{7}$$
$$naf(X). \tag{8}$$
$$q(X) \leftarrow p(X), naf(r(X)). \tag{9}$$

a) Provide the full Prolog tree for the query ?- q(X).

b) Indicate explicitly if branches are eliminated from the tree.

c) Give the output in the order of the computation.