Foundations of Logic Programming
Tutorial 4 (on December 15th)

Lukas Schweizer

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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 ← .
p ← p.
q ← r.
q ← ¬r, p.
r ← ¬p.
t ← q.
t ← r,¬q.
```

a) Construct the dependency graph D_P of P.

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

c) Give a stratification of P.

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

Exercise 5.3:
Consider the following program:

```
    p(X) ← r([a|X])
r([Y|X]) ← s(X)
s([Y|X]) ← p(X)
```

a) Provide a level mapping for which the program is recurrent.

b) Provide a bounded query for this level mapping which contains at least one variable.

c) Provide an unbounded query for this level mapping.