

Foundations of Logic Programming

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Exercise 5.1

Show with the help of the Prolog tree how the cut is used in the following program,

```
(r1)  r(a).
(r2)  r(b).
(r3)  q(a) :- r(X), !, p(a).
(r4)  q(f(X)) :- r(X).
(r5)  p(X) :- r(X).
(r6)  p(f(X)) :- q(X), !, r(X).
(r7)  p(g(X)) :- r(X).
```

and where the query `?- p(X).` is taken. What would happen without the cut?

Exercise 5.2

Write a predicate `most_frequent(List, Item)` in Prolog that finds the most frequently occurring item `Item` in a list `List`. If there are two or more items in the list that occur equally often (i.e., with the same frequency), return only the one whose first occurrence is closest to the beginning of the list.

Examples:

```
?-most_frequent([1,2,3,1,2], Item). returns Item = 1.
```

```
?-most_frequent([1,2,3,1,2,3,2], Item). returns Item = 2.
```

Exercise 5.3

Consider the program P :

- (1) $num(0).$
- (2) $num(s(x)) \leftarrow num(x).$
- (3) $odd(s(x)) \leftarrow \neg odd(x), num(x).$

- a) Using the “leftmost” selection rule, show the sequence of pre-SLDNF-trees which leads to a successful SLDNF-tree for

$$P \cup \{\neg odd(s(s(0)))\}.$$

- b) Show two successful SLDNF-derivations with different CAS's for

$$P \cup \{odd(x)\}.$$