Notes:

- Solve these exercises in **groups of three**! For other group sizes **less points** are given!
- The solutions must be handed in **directly before** (very latest: at the beginning of) the exercise course on Wednesday, 19.06.2013, in lecture hall **AH 2**. Alternatively you can drop your solutions into a box which is located right next to Prof. Giesl’s office (this box is emptied **a few minutes before** the exercise course starts).
- Please write the **names** and **immatrikulation numbers** of all (three) students on your solution. Also please staple the individual sheets!

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**Exercise 1 (SLD tree):**

(9+1=10 points)

Consider the following logic program \( P \):

\[
\begin{align*}
\text{path}(X, X, Y). \\
\text{path}(X, Y, s(Z)) & :\text{ edge}(X, A), \text{ path}(A, Y, Z). \\
\text{path}(X, Y, Z) & :\text{ eps}(X, A), \text{ path}(A, Y, Z). \\
\text{edge}(a, b). \\
\text{edge}(b, a). \\
\text{edge}(c, d). \\
\text{edge}(d, b). \\
\text{eps}(b, c).
\end{align*}
\]

The predicates **edge** and **eps** define the following graph \( G \):

```
  a -- e -- b
    \ |
     \|
      \|
    \ e -- c
      |     |
      |     |
      d
```

Furthermore, \( \text{path}(X, Y, Z) \) is true iff there is a path from \( X \) to \( Y \) in \( G \) where at most \( Z \) non-\( e \)-edges are used along the path. As an example, \( \text{?-} \text{path}(a, a, s(0)) \) gives the solutions \( X = a, X = b, \) and \( X = c. \)

a) Please give a graphical representation of the (finite) SLD tree for the query \( \text{?-} \text{path}(a, a, s(a(0))) \).

b) Change the order of exactly two literals in the clauses of \( P \) such that for the query from the first exercise part the resulting SLD tree is infinite.

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**Exercise 2 (SLD tree):**

(2 points)

Consider the following logic program \( P \):

\[
\begin{align*}
\text{p}(X, s(Y)) & :\text{ q}(Y), \text{ p}(Y, b). \\
\text{p}(0, b). \\
\text{q}(0). \\
\text{q}(s(X)) & :\text{ q}(X).
\end{align*}
\]

Below the corresponding SLD tree for the query \( \text{p}(W, Z) \) is shown. Here, \( \infty \) indicates nodes leading to an infinite computation and \( \nabla \) marks nodes that cannot be evaluated further.
Give the answer substitutions in the order Prolog finds them. Explain your answer.