1 (3 points)

1. Consider the following program $P$:

$$p(X,Y) \leftarrow q(X,Y,Z), \ p(Y,Z)$$
$$p(b,V)$$
$$q(b,X,b)$$

The goal $G$ is $\leftarrow p(X,c)$. Apply the following computation rules and show the corresponding SLD-trees.

a) Select always the leftmost atom, as it is done in the standard Prolog implementation.

b) Select always the rightmost atom.

2. $P$ is the program below:

$$p(X) \leftarrow q(Y), \ r(Y)$$
$$q(h(Y)) \leftarrow q(Y)$$
$$r(g(Y)) \leftarrow$$

$\leftarrow p(a)$ is the goal $G$. Use again two computation rules and show the SLD-trees:

a) Select always the leftmost atom.

b) Throw a dice and use the result of value $n$ to select the $n$-th atom.

2 (3 points)

Let $P$ be the following program.

$$p(a,b) \leftarrow$$
$$p(c,b) \leftarrow$$
$$p(X,Z) \leftarrow p(X,Y), \ p(Y,Z)$$
$$p(X,Y) \leftarrow p(Y,X)$$

and $G$ is the goal $\leftarrow p(a,c)$. Show that, if any clause of $P$ is omitted then the SLD-tree for $P$ and $G$ has no success branch.
A success branch is a branch that has finite length and terminates with the empty clause as goal.

3 (4 points)
Consider the program P. Find two SLD-trees for P and the goal ← p(a), such that (i) one tree is infinite and (ii) the other is finite.

\[
p(X) \leftarrow q(Y), r(Y)
q(h(Y)) \leftarrow q(Y)
r(g(Y)) \leftarrow
\]