Automated Theorem Proving

Logic Programming

<u>Exercise 1</u>. Write a Prolog program to compute n! for every natural number n.

<u>Exercise 2</u>. Write a Prolog program to compute the nth term of the Fibonacci sequence for every natural number n.

<u>Exercise 3</u>. Write a Prolog program that, for a natural number n, works out the value of

$$\sum_{\substack{0 \le k \le n \\ k \text{ even}}} \frac{1}{2^k} + \sum_{\substack{0 \le k \le n \\ k \text{ odd}}} \frac{1}{3^k}.$$

Exercise 4. Write a Prolog program to solve the following puzzle:

Tom, Mike and John are members of the alpine club. Each member of the alpine club is either a skier or a climber. No climber likes the rain and all skiers like the snow. Mike likes everything that Tom dislikes and vice versa, he dislikes everything that Tom likes. Mike and John like the snow. Is there a member of the alpine club who is a climber but not a skier ?

HINT: In order to write the program, use a predicate notskier(X) for "X is not a skier".

<u>Exercise 5</u>. Consider the following program:

select(X, [X|L], L). select(X, [Y|L1], [Y|L2]): - select(X, L1, L2).

Then, give the Prolog's trace for the goal select (X, [a, b, c], L).

<u>Exercise 6</u>. (a) Write a Prolog program to compute the sum of the elements of a list of integers.

(b) Write a Prolog program to compute the product of the elements of a list of integers.

Exercise 7. Write a Prolog program to find the pairs of elements which are consecutive in a list.

<u>Exercise 8</u>. Write a Prolog program that gives all the permutations of a list of integers.

<u>Exercise 9</u>. Write a Prolog program for the predicate delete(X, L1, L2):-"L2 is the list obtained by deleting in the list L1 every occurrence of X".

<u>Exercise 10</u>. We have a map of cities in a country and we have a fix list E of cities in the country. Then:

(a) Write a Prolog program to find a way between two cities in the country which are not in E and such that the way avoids the cities in the list E.

(b) Write a Prolog program to find the shortest way between two cities in the country which are not in E and such that the way avoids the cities in the list E.