Prolog for Artificial Intelligence

Write Prolog programs that define the following predicates. Your programs should ensure that backtracking does not produce spurious alternative solutions.

(a) The \( n \)th element of a list: \( \text{nth}(X,N,L) \) instantiates \( X \) to the \( N \)th element of list \( L \). Assume that list elements are numbered increasing from 1. [4 marks]

(b) The last element of a list: \( \text{last}(X,L) \) instantiates \( X \) to the last element of list \( L \). [4 marks]

(c) Remove an element from a list: \( \text{remove}(X,L,M) \) instantiates \( M \) to a list containing all the elements of list \( L \) except for every occurrence of term \( X \). [6 marks]

(d) Substitute one element for another: \( \text{subst}(L,X,Y,M) \) instantiates \( M \) to a list containing all the elements of list \( L \) except that every occurrence of term \( X \) in \( L \) is replaced by term \( Y \) in \( M \). [6 marks]