A binary number is a representation of a number in base 2. It consists of a sequence of binary digits (or bits). Each bit \( b_i \) either has the value 0 or the value 1. The decimal value of a binary number \( b_n b_{n-1} \ldots b_0 \) can be computed as follows:

\[
b_n2^n + b_{n-1}2^{n-1} + \ldots + b_12^1 + b_02^0
\]

where \( 2^0 = 1 \). Binary numbers can be represented in Scheme as lists of boolean values representing bits. The boolean value \#f can be used to represent 0 and the boolean value \#t can be used to represent 1. The bits appear in the list in reverse order. For example, the binary number 10010 (with decimal value 18) can be represented by the list \((\#f \ #t \ #f \ #f \ #t)\). The binary number 0 can be represented by the empty-list and the binary number 1 by the singleton list \((\#t)\).

1. Give a definition for a function, \textit{nzero?}, which returns \#t if its argument is the binary representation of the natural number zero and \#f otherwise.

2. Give a definition for a function, \textit{nadd1}, which given a binary number, returns a binary representation of a natural number which is arithmetically greater by one.

3. Give a definition for a function, \textit{nsub1}, which given a binary number, returns a binary representation of a natural number which is arithmetically lesser by one.

4. Using the definition of \textit{n*} given in class, give the binary representation for the natural number which is the product of the natural numbers with binary representations \((\#f \ #t \ #t \ #t \ #f \ #t \ #f \ #t)\) and \((\#t \ #t \ #t \ #f \ #t \ #t)\).

5. Give a definition for a function \textit{n=}, which returns \#t if its natural number arguments are arithmetically equal and \#f otherwise.

6. Do the following exercises from Springer and Friedman: 4.1, 4.4, 4.6, 4.10, 4.11