Homework - Version B.

Exercise 1

We define the syntactic category of bits $B = \{0, 1\}$. By b we denote a meta-variable ranging over B. We define inductively a set of bitstrings BS by the following BNF:

$$bs := b \mid 0 \ bs \ 0 \mid 01 \ bs \ 10$$

where bs is a meta-variable ranging over the set of bitstrings BS. Of the following two statements, one is wrong and one is right. You get to tell which is which and justify your answers by either a proof (by induction) or a counter-example.

1. In the set of bistrings BS, all elements contain at least one 0.

2. Every bitstring in the set BS is a palindrome.

A palindrome is a sequence of symbols that reads the same from right to left or left to right (e.g. 'Rise to vote sir' is one, 1001 is one too).

Exercise 2

We consider the following program.

```
begin   var  z₁ := 43;
        var  z₂ := 5 * (z₁ − 1);
        proc toto is z₁ := 3 * (z₂ + z₁);
        begin var  z₂ := 1;
        proc toto is z₁ := z₂ + 45;
        proc q is call toto;
        call q;
        end
        call toto;
end
```

You have been presented three different semantics for the While language with blocks and procedures: one with dynamic links for variables and procedures, another with dynamic links for variables but static links for procedures, and finally one with static links for variables and procedures.

What values are associated to z_1 and z_2 at the end of this program according to each of the three semantics you know ? Justify your answer (you can either draw the tree or precise the state or the variable environment and the storage function after each ';').