Assignment 6 Part 2

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5.9 - 6 Define a set S recursively as follows
I - BASE $a \in S$
II - RECURSION : if $s \in S$ then a) $sa \in S$
b) $sb \in S$
III - RESTRICTION : Nothing is in S other than objects defined in I and II
Use structural induction to prove every string in S begins with an a
The only object in the base case is "a"
The recursion for S consists of two rules a: $sa \in S$ and b: $sb \in S$.
Suppose s is a string in S that begins with a. In the case where $sa \in S$ is applied to s. the resulting string is a, which begins with a.
When we look at $sb \in S$ the resulting string is ab which also begins with a. When the rules of recursion is applied in string S the string will begin with a.

5.9 - 10 Define a set S recursively as follows.
I - BASE $0 \in S$, $5 \in S$
II - RECURSIVE If $s \in S$ then $t \in S$
a $s+t \in S$ b $s-t \in S$
III RESTRICTION : Nothing is in S other than objects defined in I and II
Use structural induction to prove every integer S is divisible by 5
The two base cases for this set is 0 and 5. Both are divisible by 5
The recursion function consists of two rules $s+t \in S$ and $s-t \in S$.
Suppose s and t a number that is divisible by 5. Since both $s \in S$ and $t \in S$ then the sum of the two numbers must be divisible by 5.
With the rule of recursion applied $s-t$ must also be divisible by 5

5.9 - 13b Consider the set P of parenthesis structures defined in 5.9.4. Give derivations showing that each of the following is in P.

b (())(())
(1) by I () is in P
(2) by (1) and II(a), (()) is in P
(3) by (2) and II(b), (())(()) is in P

5.9 - 16 Give a recursive definition for the set of all string of 0's and 1's for which all of the 0's precede the 1's

Let S be the set of all strings of 0's and 1's for which all of the 0's precede the 1's.
I. BASE $0 \in S$.
II. - RECURSION a) $01s \in S$ b $s01 \in S$ c) $0s1 \in S$
III RESTRICTION There are no element S other than those obtained by II