PPL - ASSIGNMENT 5

חלק 1

1.1.b טענה: הפרוצדורה append$ שקולה - CPS לפרוצדורה fact. כלומר, לכל שתי רשימות lst1, lst2, ולכל continuation, אשר יסומן ע"י cont, מתקיים: (append$ lst1 lst2 cont) = (cont (append lst1 lst2)).

הוכחה: הפרוצדורה append היא רקורסיבית, לכן ההוכחה תהיה באינדוקציה על אורך הרשימה הראשונה, נסמנו ב-n.

בסיס האינדוקציה - n=0

a-e[(append$ [] lst2 cont)] ⇒* a-e[(cont lst2)]

a-e[cont (append [] lst2))] ⇒* a-e[(cont lst2)]

הנחת האינדוקציה - הטענה מתקיימת עבור רשימה lst1 באורך n. כלומר:

(append$ lst1 lst2 cont) = (cont (append lst1 lst2))

צעד האינדוקציה - נוכיח את הטענה עבור רשימה lst1 באורך n+1.

a-e[(append$ lst1 lst2 cont)] ⇒*

a-e[(append$ (cdr lst1) lst2 cont)] =

a-e[(cont (append ((cdr lst1) lst2))] ⇒*

lst1 הוא באורך n+1, לכן (cdr lst1) באורך n, אזי השוויון מתקיים לפי הנחת האינדוקציה.

a-e[(cont (cons(car lst1) (append (cdr lst1) lst2))]

a-e[(cont (append lst1 lst2))] ⇒*

a-e[(cont (cons(car lst1) (append (cdr lst1) lst2))]

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(define append$
  (lambda (x y c)
    (if (empty? x)
        (c y)
        (append$ (cdr x) y (lambda (res) (c (cons (car x) res)))
        ))))
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1. unify[t(s(s), G, s, p, t(K), s), t(s(G), G, s, p, t(K), U)]

Initialization: $S=\{\}$

$A=t(S(S),G,S,P,t(K),S)$, $B=t(S(G),G,S,P,t(K),U)$.

We'll look from left to right and look for a difference between A and B.

The first difference is S(S) and S(G), so:

$S=S\circ\{G=S\}=\{G=S\}$.

Now - $A=t(S(S),S,S,P,t(K),S)$, $B=t(S(S),S,S,P,t(K),U)$.

We'll look from left to right for the next difference.

The next difference is S and U, so:

$S=S\circ\{S=U\}=\{S=G\}\circ\{S=U\}=\{S=G,S=U\}$.

We'll look from left to right for the next difference.

Now - $A=t(S(S),S,S,P,t(K),S)$, $B=t(S(S),S,S,P,t(K),S)$.

Now we can see that A=B.

The result is: $S=\{S=G,S=U\}$.

2. unify[g(l,M,g,G,U,g,v(M)), g(l,v(U),g,v(M),v(G),g,v(M))]

Initialization: $S=\{\}$

$A=g(1,M,g,G,U,g,V(M))$, $B=(1,V(U),g,V(M),V(G),g,V(M))$.

We'll look from left to right and look for a difference between A and B.

The first difference is M and V(U), so:

$S=S\circ\{M=V(U)\}=\{M=V(U)\}$.

Now - $A=g(1,V(U),g,G,U,g,V(V(U)))$, $B=(1,V(U),g,V(V(U)),V(G),g,V(V(U)))$.

We'll look from left to right for the next difference.

The next difference is G and V(V(U)), so:

$S=S\circ\{G=V(V(U))\}=\{M=V(U),\{G=V(V(U))\}$.

We'll look from left to right for the next difference.

Now - $A=g(1,V(U),g,V(V(U)),U,g,V(V(U)))$, $B=(1,V(U),g,V(V(U)),V(V(V(U))),g,V(V(U)))$.

We'll look from left to right for the next difference.

The next difference is U and V(V(V(U))), so:

S = S ∘ {U = V(V(V(U)))} = {M = V(U), G = V(V(U)), U = V(V(V(U)))}. ⟶ Failure.

We received a failure because a variable can't include itself and we found that:

U = V(V(V(U))).

3. unify[m(M,N), n(M,N)]

Initialization: S = {}

A = m(M,N), B = n(M,N). ⟶ Failure.

We received a failure because the predicates are different, m ≠ n.

4. unify[p([v | [V | VV]]), p([[v | V] | VV])]

Initialization: S = {}

A = P([v|[V|VV]]), B = P([[v|V]|VV]).

We'll look from left to right and look for a difference between A and B.

The first difference is v and [v|V], but we can't compare a symbol with a list, so we'll receive a failure.

5. unify[g([T]), g(T)]

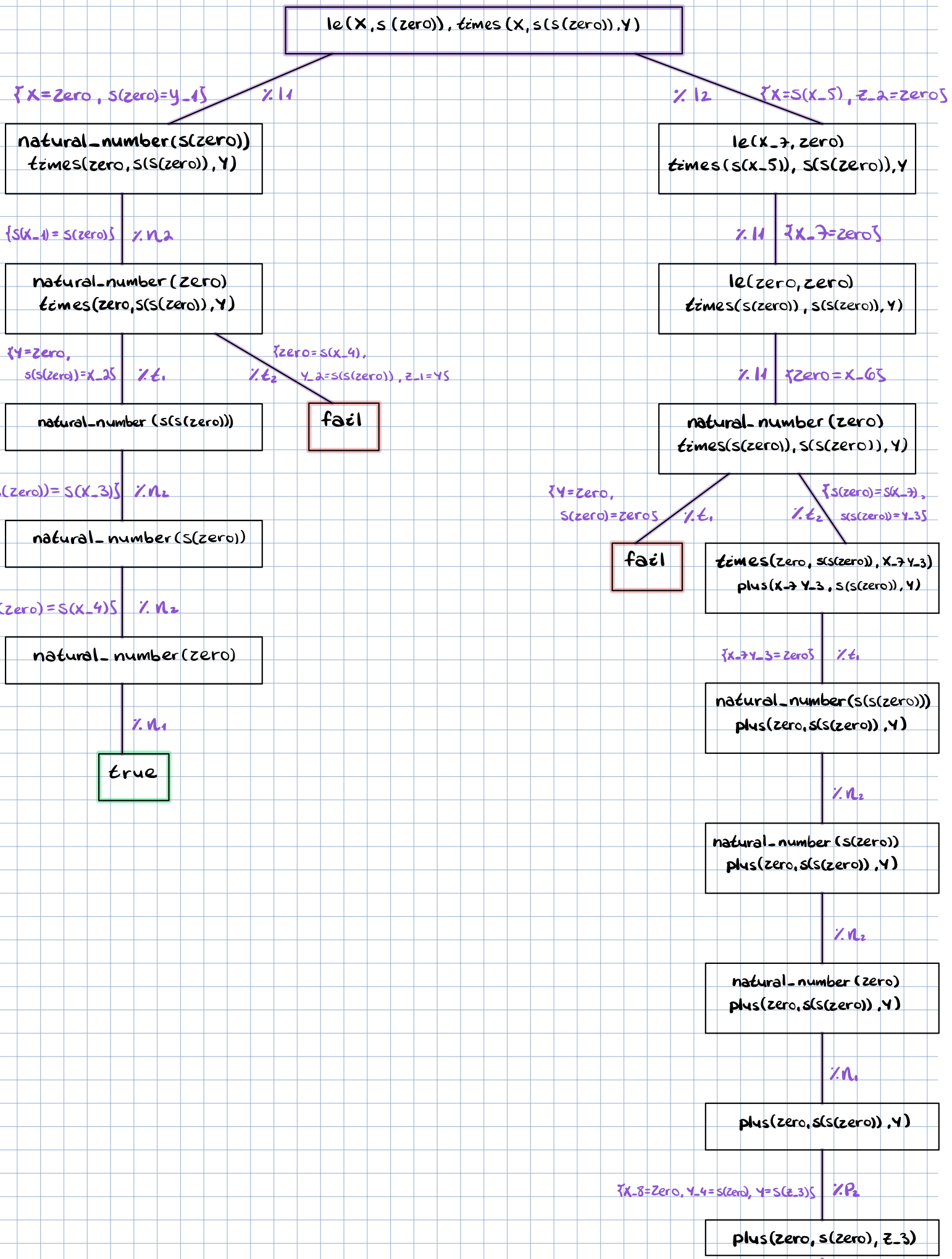
Initialization: S = {}

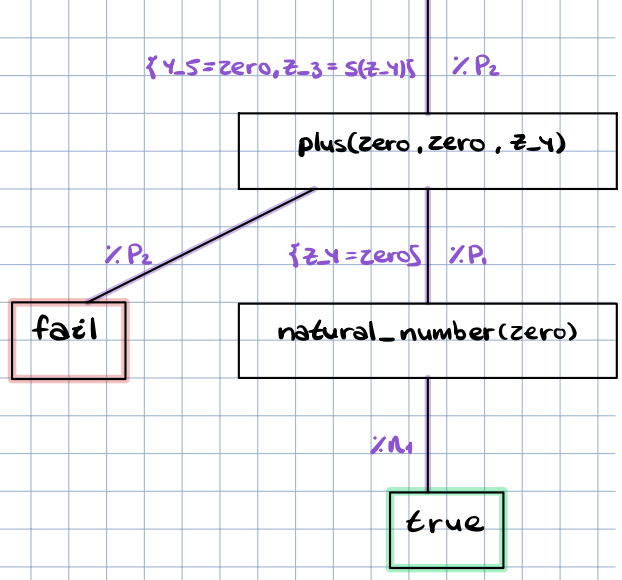
A = g([T]), B = g(T).

We'll look from left to right and look for a difference between A and B.

The first difference is [T] and T, but we can't compare a variable with a list of the same variable, so we'll receive a failure.

?- le(X,s(zero)), times(X,s(s(zero)),Y).




{Y_5=zero, Z_3=s(Z_4)}
% P2
plus(zero, zero, Z_4)
% P2
{Z_4=zero}
% P1
fail
natural_number(zero)
% N1
true