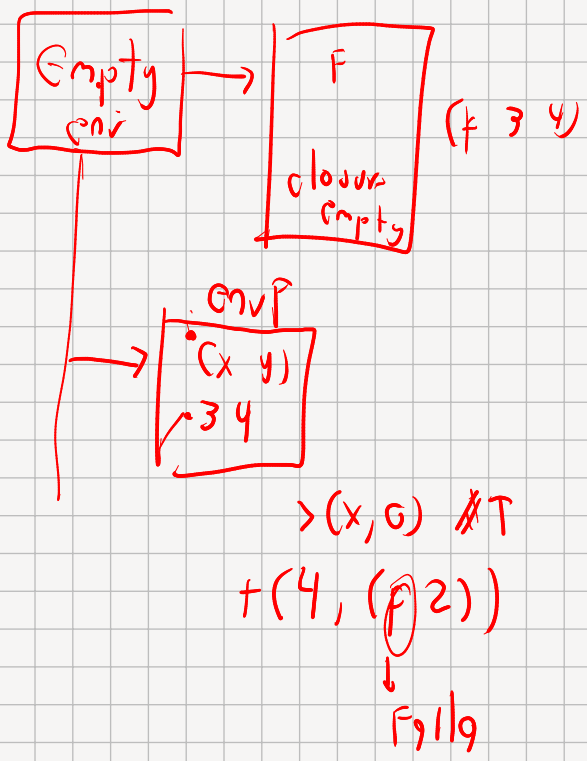
Procedimientos recursivos

```
let
    f = proc(x,y) if >(x,0) then +(y,(f -(x,1) y)) else y
  else
       (f 3 4)
```

Error




```
letrec
  ( <identificador> "(" (<identificador>,>)* ")" =
                <expresion> )*
 in
  <expresion>
```

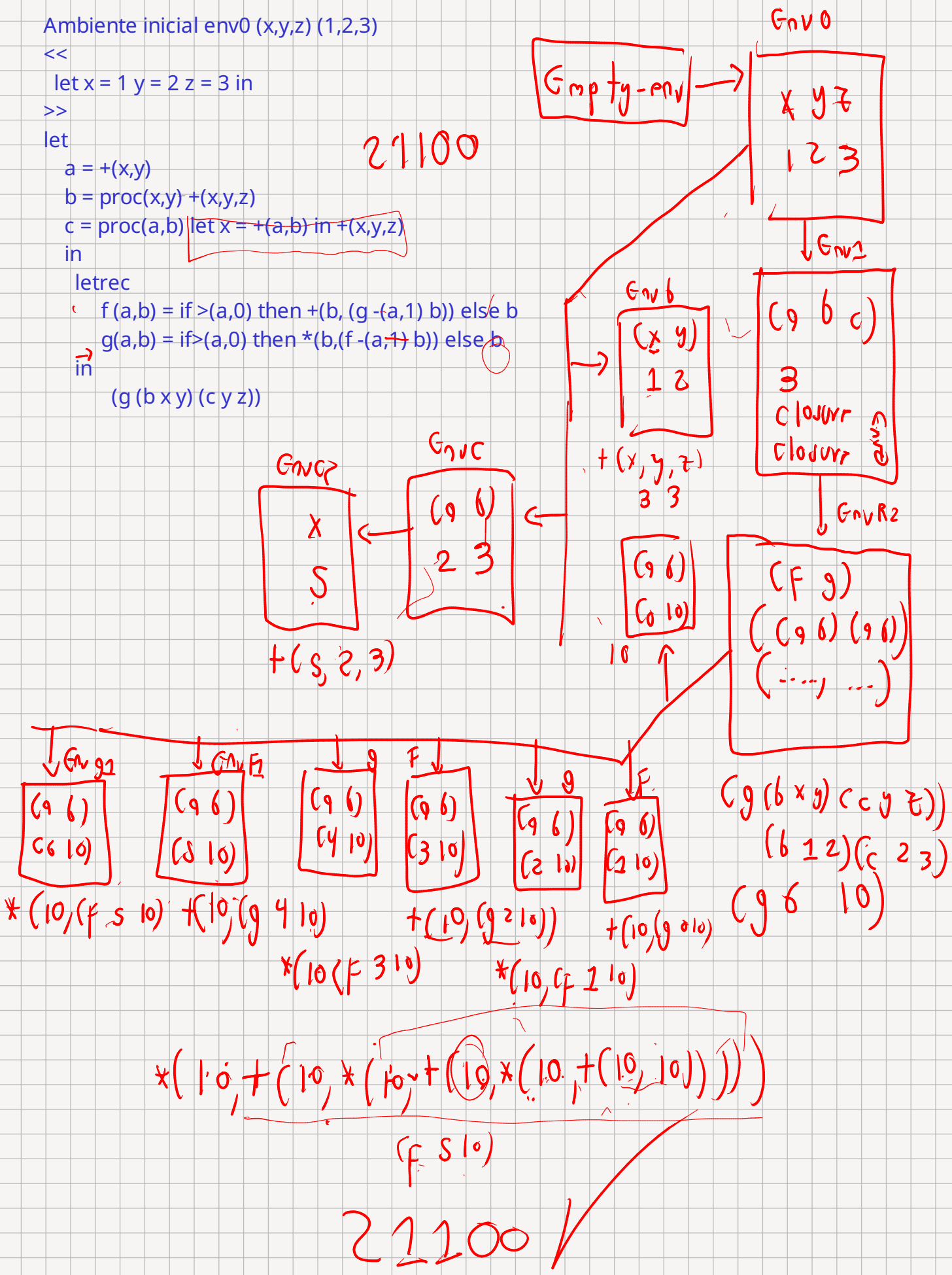
```
letrec
   f(a,b) = if >(a,b) then +(a, (f -(a,1) b)) else b
   g(a,b) = if >(a,b) then *(a,(g -(a,1) b) else b
  in
    +( (f 2 3) (g 2 3))
```

1) Introducir en la gramática el caso del letrec
2) Introducir un nuevo tipo de ambiente ambiente-extendido-recursivo
que es un caso ESPECIAL que solo contiene PROCEDIMIENTOS
3) Cambiar el apply-env de tal manera que si un proc está dentro de un ambiente
extendido debo generar una nueva clausura (va a guadar el ambiente extendido recursivo)

Ambiente inicial env0 (x,y,z) (1,2,3)

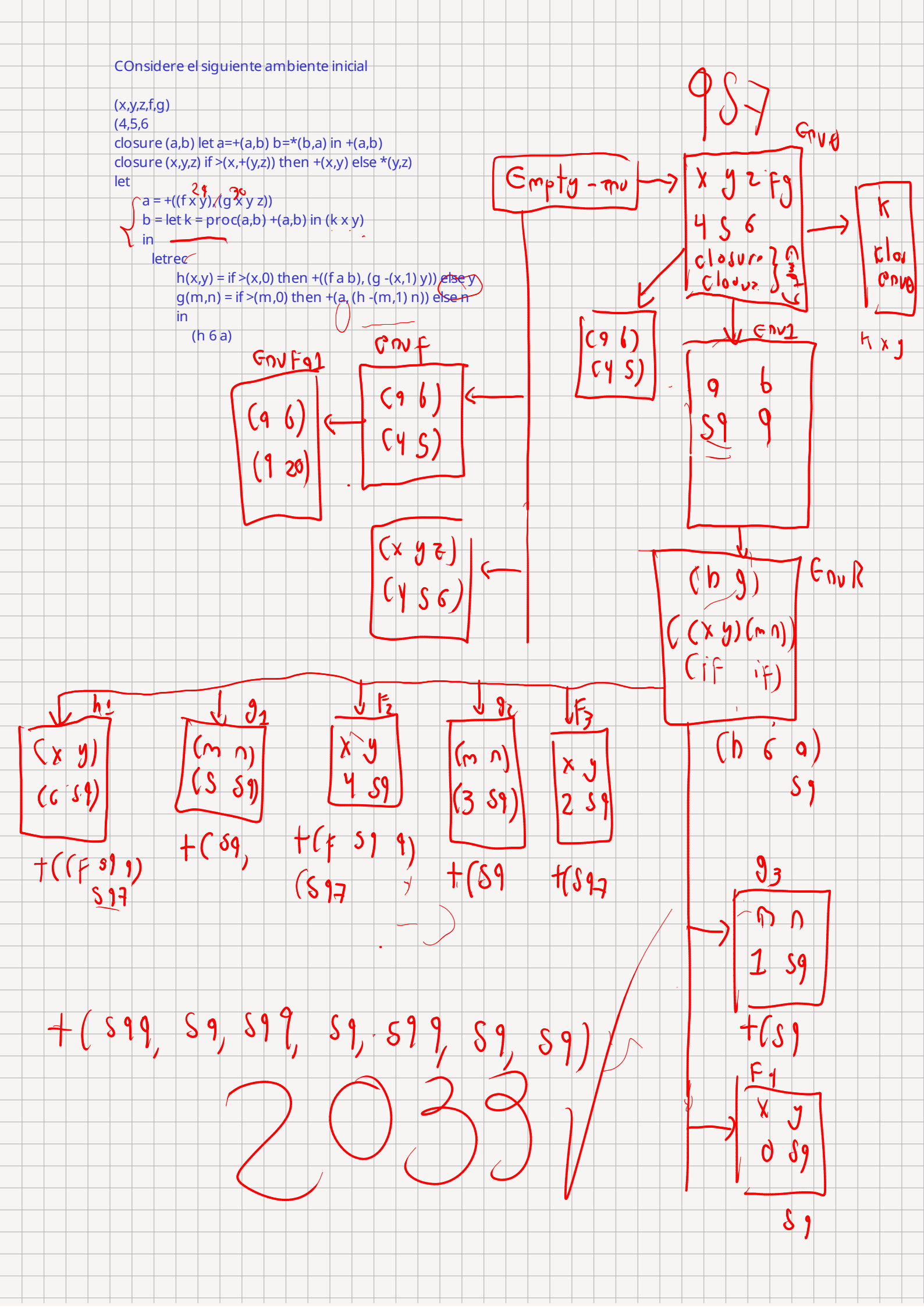
```
<<
 let x = 1 y = 2 z = 3 in
>>
let
   a = +(x,y)
   b = proc(x,y) +(x,y,z)
   c = proc(a,b) let x = +(a,b) in +(x,y,z)
   in
    letrec
       f (a,b) = if >(a,0) then +(b, (g -(a,1) b)) else b
       g(a,b) = if>(a,0) then *(b,(f -(a,1) b)) else b
    in
        (g (b x y) (c y z))
```

21100



COnsidere el siguiente ambiente inicial

(x,y,z,f,g)
(4,5,6
closure (a,b) let a=+(a,b) b=*(b,a) in +(a,b)
closure (x,y,z) if >(x,+(y,z)) then +(x,y) else *(y,z)
let
a = +((f x y), (g x y z))
b = let k = proc(a,b) +(a,b) in (k x y)
in
letrec
h(x,y) = if >(x,0) then +((f a b), (g -(x,1) y)) else y
g(m,n) = if >(m,0) then +(a, (h -(m,1) n)) else n
in
(h 6 a)



closure (a,b) let a=+(a,b) b=*(b,a) in +(a,b)