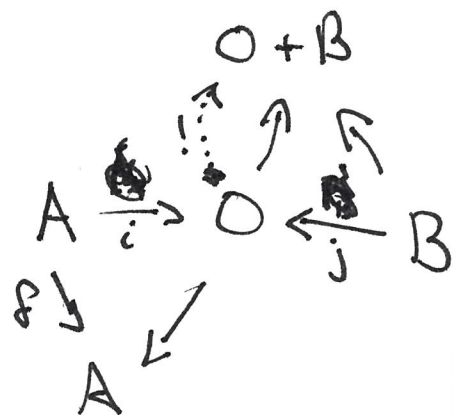


Tjhe Dolen

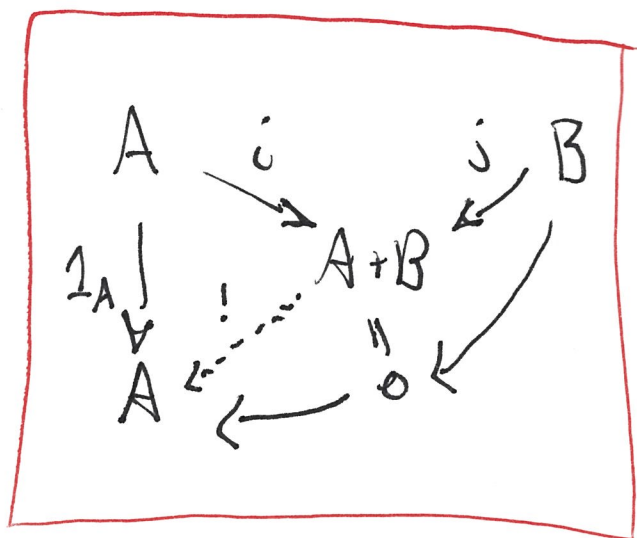
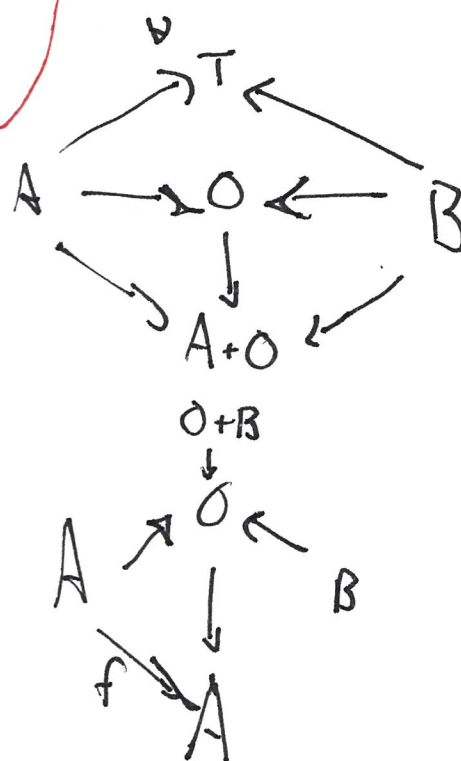
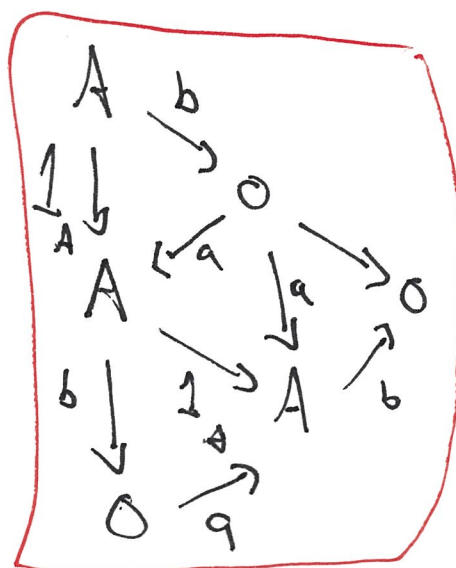
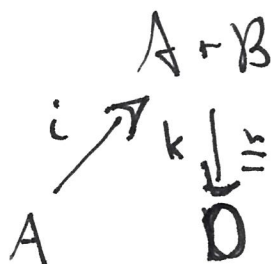
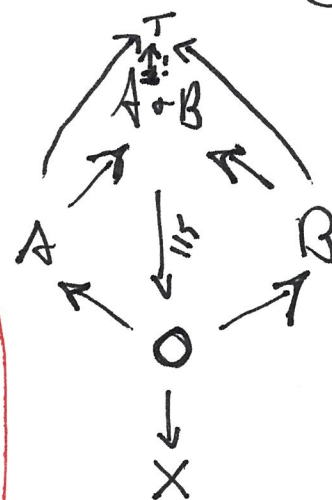
①

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Try to make negatives  
coproduct

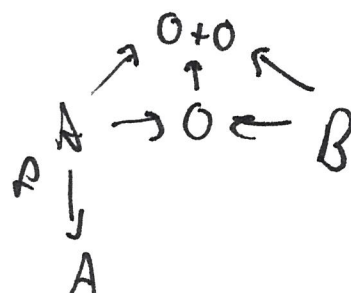


$$A + B = 0$$



Here fore

$$A \cong 0$$



What about?

$$[X, X] \cong X$$

Need a doctrine  
with internal hom.

Step 2 **Structure**  
(stage 2.)

Category of believers  $B$   
in  $l, m, r$ .

Step 3 **property**

$l + m + r$  is isomorphic.

In detail: Step 2

Belief in  $l: X \rightarrow X$  is

a map

$$\text{hom}(X, B) \xrightarrow{l_B} \text{hom}(X, B)$$

the internal hom:

$$\text{hom}(X, B) = B'$$

is the derivative!

So  $l_B: B' \rightarrow B'$

This extra  
structure looks  
like "clicking on a  
point and transforming  
it somehow."

Similarly for  $r_B: B' \rightarrow B'$ .

Fail:  $X + 1 = 0$

try:  $2X + 1 = X$

Euler characteristic  
via Schanuel:

take  $X = (0, 1) \in \mathbb{R}$   
this solves

$$X = X + 1 + X$$

$$(-) = (-)^+ + (-)$$

ie.  $\chi((0, 1)) = -1$ .

Call this  $X$  an  
Euler object:

$$X + 1 + X \xrightarrow{\cong} X$$

gives  $l: X \rightarrow X$

$$m: 1 \rightarrow X$$

Believer method  $r: X \rightarrow X$ .

~~Step~~ Step 1 freely add an  
object  $X$ . This gives  
structure types

STRUCTURE

[James Nolan]

③ 14/7/19

Example

structure type of  
pre-~~monoid~~ orders  
click on a point to  
send it to the top.  
Example structure type:

maps to  $\{a, b, c\}$

three colourings

click on a point to  
advance it's a colour:

$a \rightarrow b \rightarrow c$   
 $\leftarrow$

Need to

Check this gives a  
commutative monad,  
monad ops commute  
w. each other.

Step 2 (ctd.)

Belief in  $m$ :

$$\text{hom}(X, B) \xrightarrow{m_B} \text{hom}(1, B)$$

ie.  $m_B: B' \rightarrow B$

like  
an annihilation operator:

click on an  
element and it

goes away

eg. delete an element from a list.