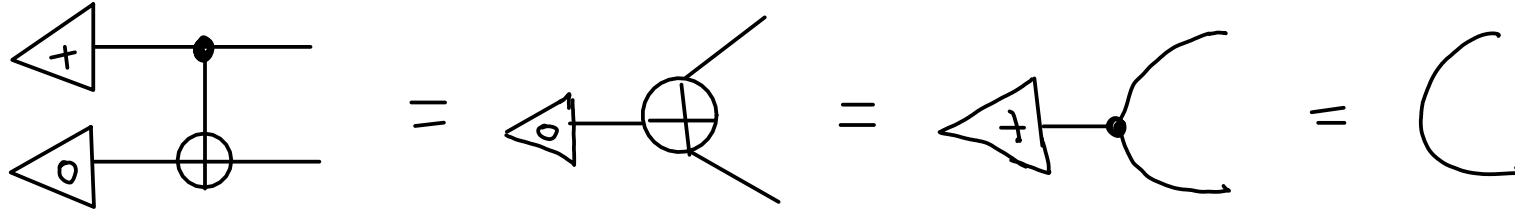
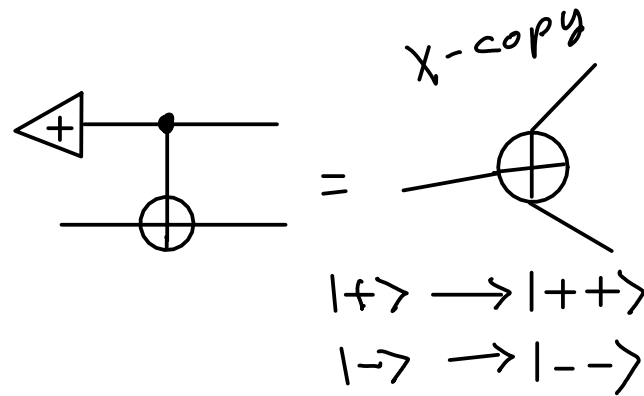
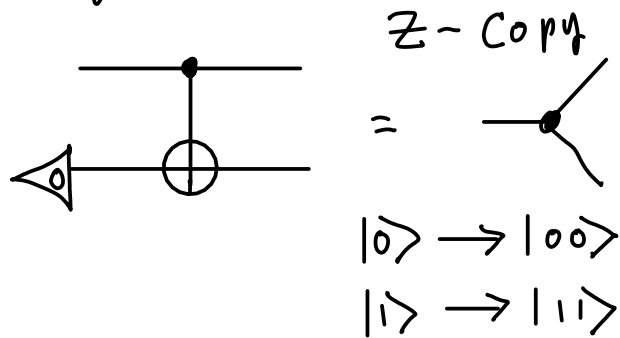


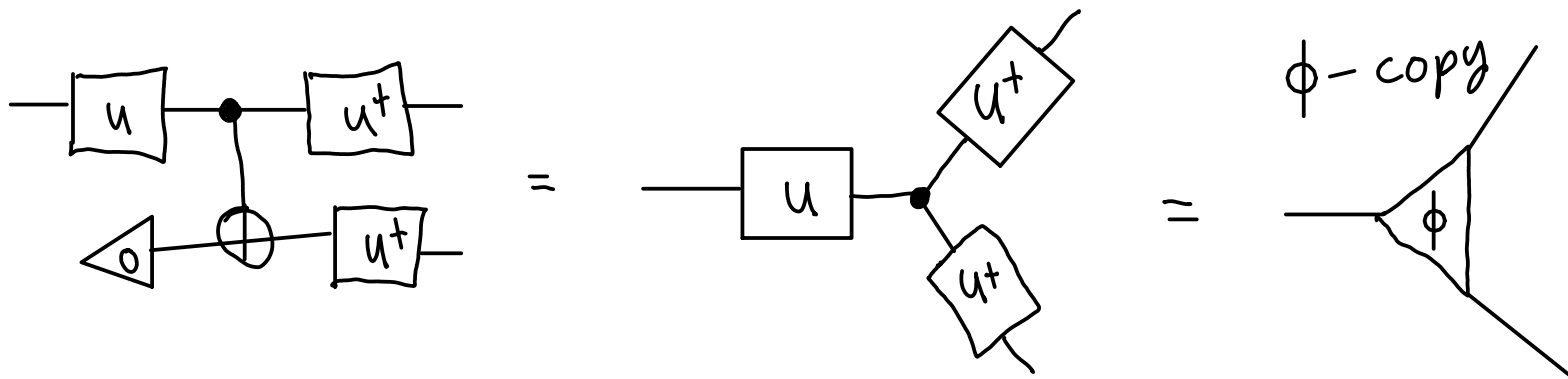
Bell States



Copy machines

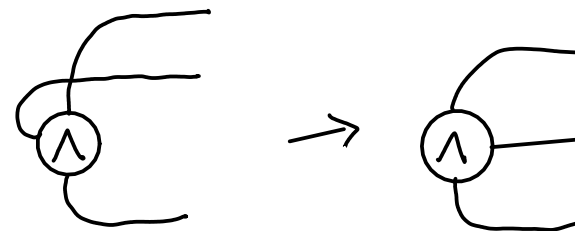
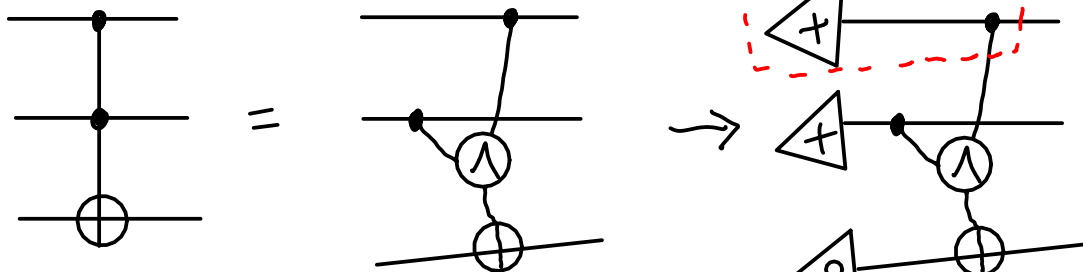


Let $u = \sum_i |\phi_i\rangle\langle\phi_i|$

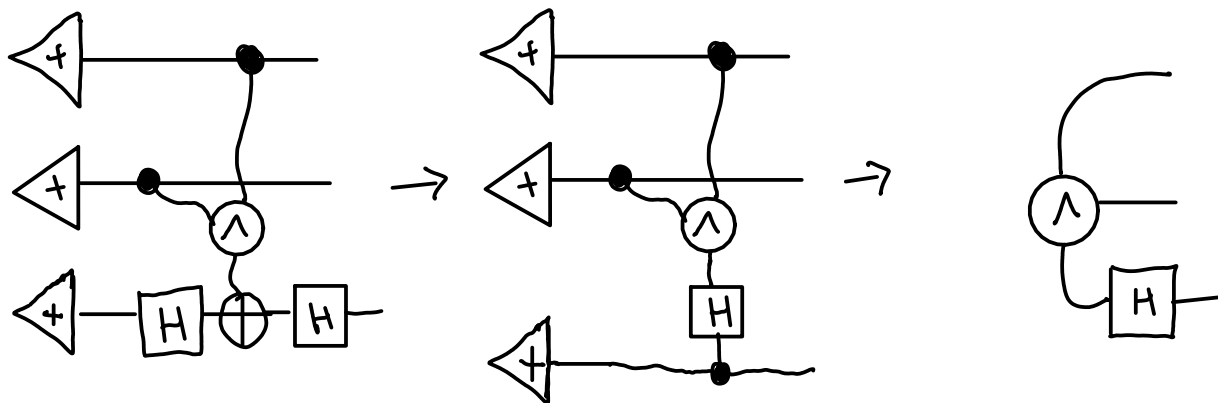
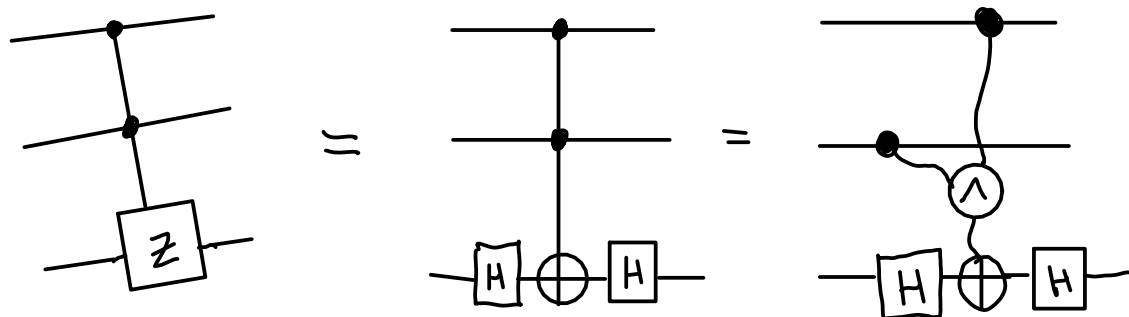


AND - States

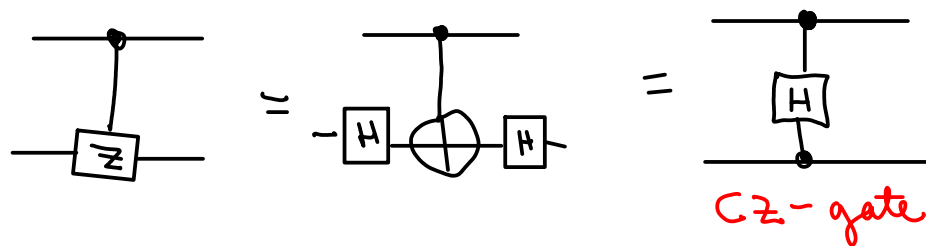
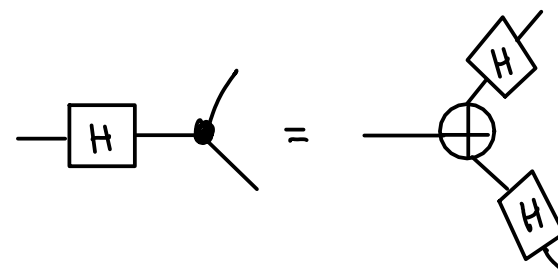
compactness



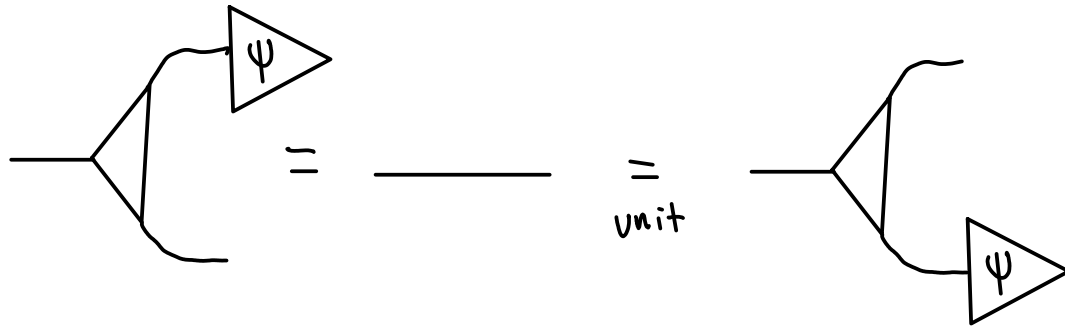
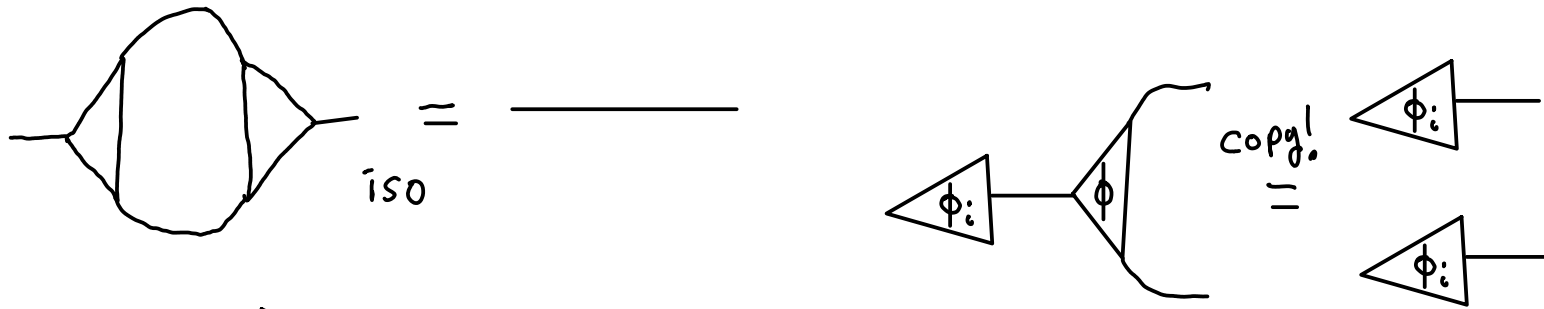
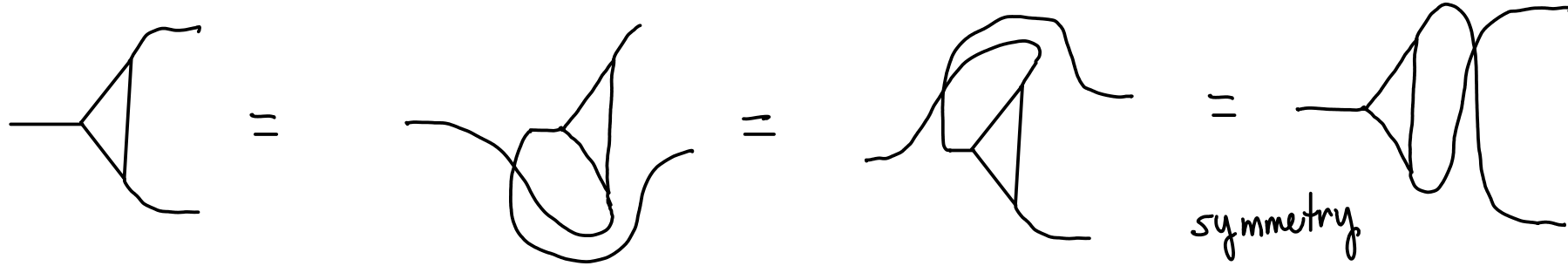
$\Psi_{\wedge} = |000\rangle + |100\rangle + |010\rangle + |111\rangle$
 Bit pattern is the truth table for AND.



$= |00+\rangle + |01+\rangle + |10+\rangle + |11+\rangle$

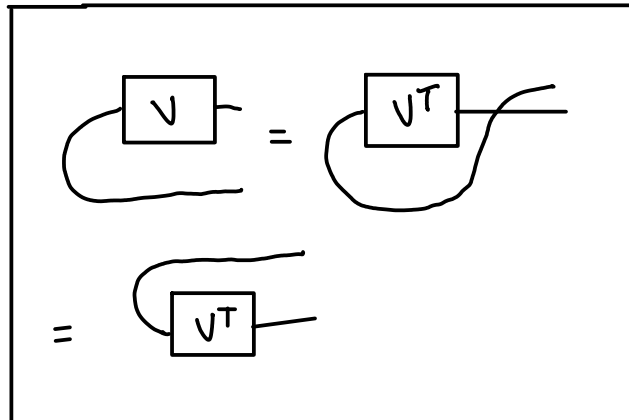
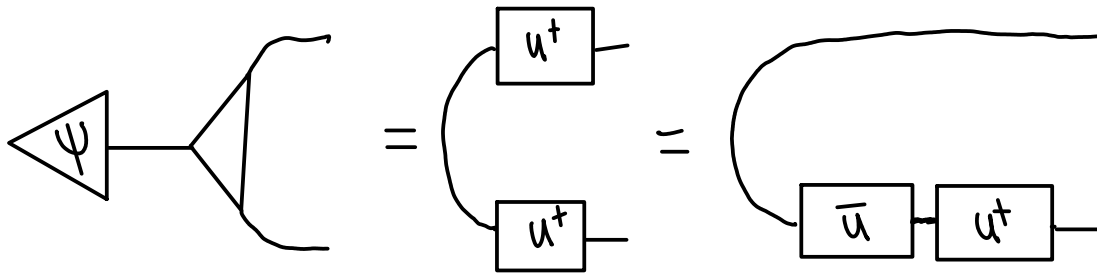


For any ϕ -copy (as defined above)

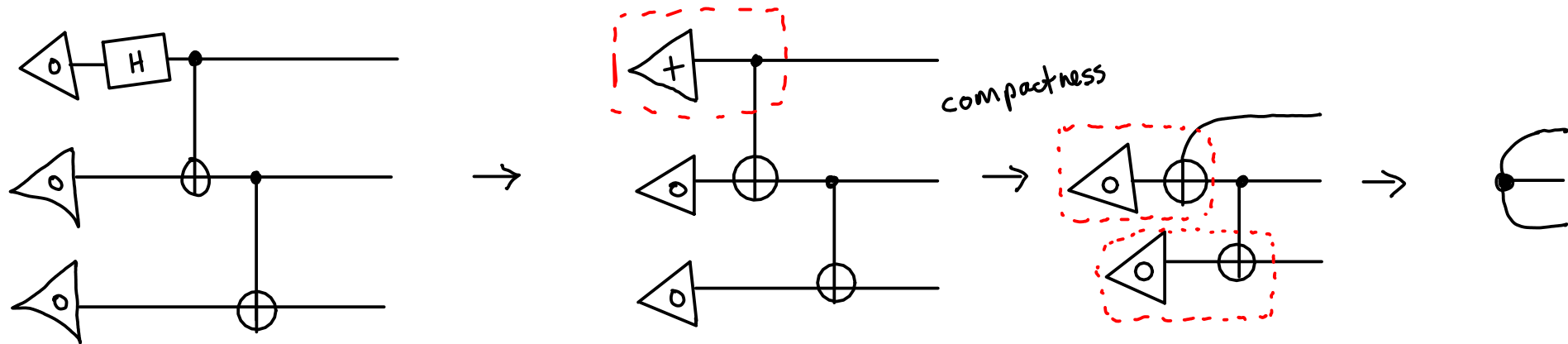


$$|\psi\rangle = \sum_i |\phi_i\rangle$$

(Think of as post selection)

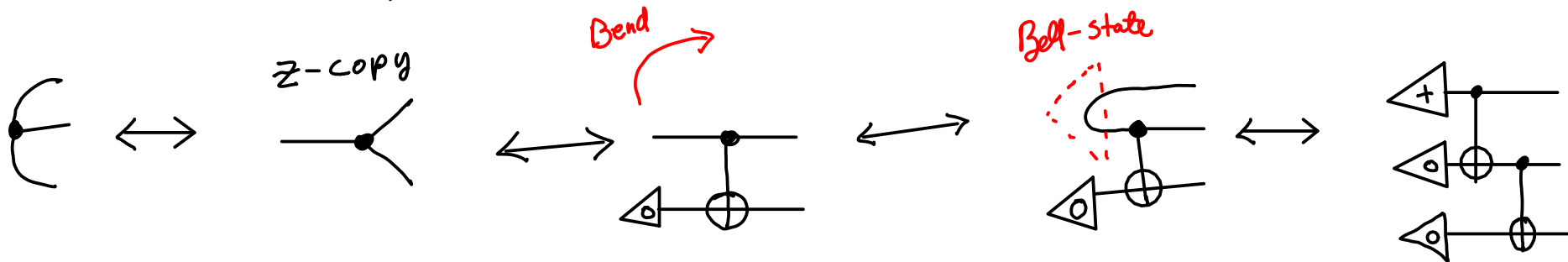


GHZ - States

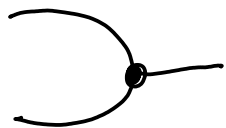


Duality of GHZ

using $\eta = \sum_i |i\rangle\langle i|$ and $\epsilon = \sum_i \langle i|\langle i|$
 can construct isomorphisms between states, maps etc.



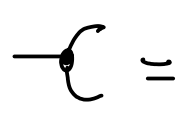
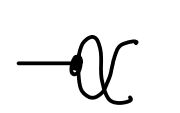
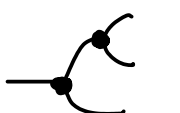
co-copy

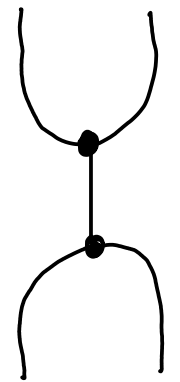
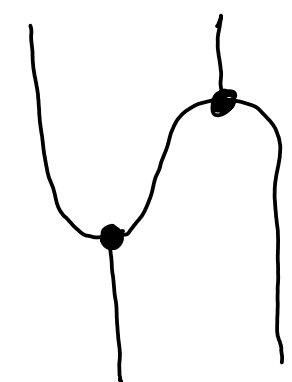


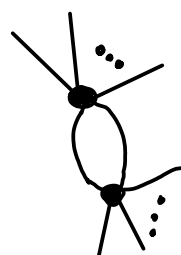
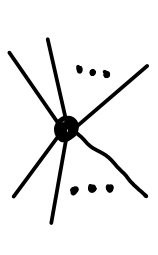
$|ii\rangle \rightarrow |i\rangle$ write $\psi \in H \otimes H$ as $\sum_j c_j |j\rangle|j\rangle$ then co-copy
 acts as $\psi \rightarrow \sum_{i,j} c_j s_{ij} |i\rangle$

- The other rules follow under +

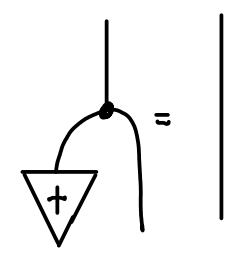
Frobenius algebra for black dots

 =
  and
  =
 

 =
 

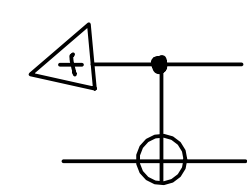
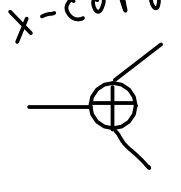
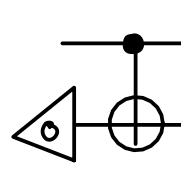
 $\Rightarrow$


unit is $|+\rangle$ as

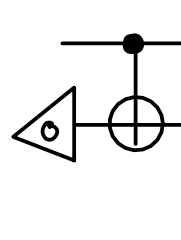
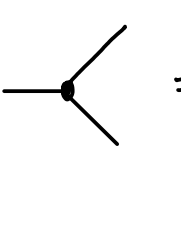
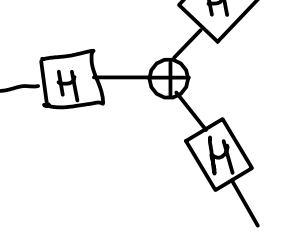
 =
 

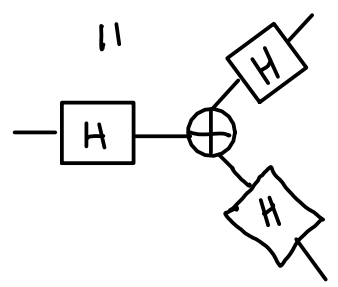
Dot-duality

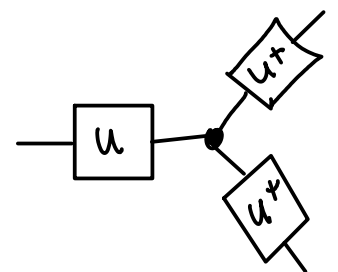
x-copy ("plus-dot")

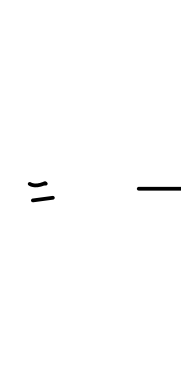
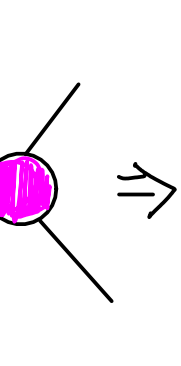
 =
  and
 

("Black-dot")

 =
  =
 





 $\Rightarrow$
 =
 