

Homework hints / solutions

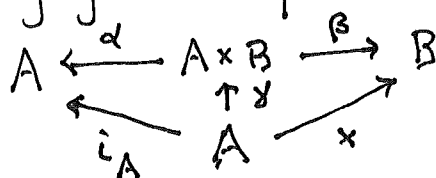
2. $f: A \rightarrow B$ and $g: A \rightarrow B$ are equal if they are equal as subsets of $A \times B$.
3. There are $|B|^{|A|}$ functions from finite set A to finite set B with $0^0 \equiv 1$.
4. This defines a relation but not necessarily a function.
5. No and No, as discussed in class.
6. If $A \xrightarrow{f} B$ is an isomorphism, then if $f \circ \alpha = f \circ \beta$, then $f^{-1} \circ f \circ \alpha = f^{-1} \circ f \circ \beta \Rightarrow \alpha = \beta \Rightarrow f$ is a monomorphism. Similarly for epi.

7. Easy

8. Let $A \xrightarrow{\psi} B \xrightarrow{\varphi} C$. If φ is not mono, then

$\varphi \circ \alpha = \varphi \circ \beta$ for some $\alpha \neq \beta \Rightarrow (\varphi \circ \psi) \circ \alpha = (\varphi \circ \psi) \circ \beta$
for some $\alpha \neq \beta \Rightarrow \varphi \circ \psi$ is not a monomorphism.

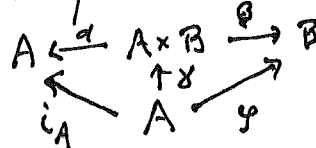
9. It's not true in every category, but if the category is such that there is always a morphism $A \xrightarrow{x} B$ between any two objects A and B , and if the category has a product, then



commutes for some γ . Since i_A is epi, so is α by problem 8.

Similarly, injections for $A \oplus B$ are mono.

11. In "17", any epi is an isomorphism. Let $A \xrightarrow{\psi} B$ be any non-isomorphism. Then



$\Rightarrow \Leftarrow$ since γ must also be iso.