Definition 18.

1. A trans-reloid is *monovalued* when it is a monovalued morhism of the category of trans-reloids.
2. A trans-reloid is *injective* when it is an injective morhism of the category of trans-reloids.

Definition 19. Let f is a trans-reloid and $\mathcal{A}$ is a f.o. on $\operatorname{Src} f$. Then $f|_{\mathcal{A}}^{\mathsf{RLD}} = f \circ I_{\mathcal{A}}^{\mathsf{RLD}(\operatorname{Src} f)}$.

We can define also trans-funcoids in a similar way but we don't need it in this work. Instead I will define applying a **Set**-morhisms to filters:

Definition 20. $\langle (f; A; B) \rangle \mathcal{X} = \bigcap^{\mathfrak{F}(B)} \langle \langle f \rangle \rangle \operatorname{up}(\mathcal{X} \div A)$ for every **Set**-morhism $(f; A; B)$ and sets A and B.

2.2.2 Some theorems about trans-reloids

In this section I do not try to build a complete set of theorems about trans-reloids, just theorems we'll need below.

Theorem 21. If $f' \sim f$ for some trans-reloids f and f' then $\operatorname{im} f \sim \operatorname{im} f'$ and $\operatorname{dom} f \sim \operatorname{dom} f'$.

Proof. There exists a binary relation $K \in \operatorname{up} f, \operatorname{up} f'$ such that $\mathscr{P}K \cap f = \mathscr{P}K \cap f'$. Thus $\operatorname{im} f = \operatorname{im}^{\mathsf{RLD}(\operatorname{Src} f; \operatorname{Dst} f)}(\mathscr{P}K \cap f) = \operatorname{im}^{\mathsf{RLD}(\operatorname{Src} f; \operatorname{Dst} f)}(\mathscr{P}K \cap f') \sim \operatorname{im}^{(\operatorname{Src} f'; \operatorname{Dst} f')}(\mathscr{P}K \cap f') = \operatorname{im} f'$. □

Theorem 22. For every trans-reloids f, g:

1. If $\operatorname{im} f \supseteq \operatorname{dom} g$ then $\operatorname{im}(g \circ f) = \operatorname{im} g$.
2. If $\operatorname{im} f \subseteq \operatorname{dom} g$ then $\operatorname{dom}(g \circ f) = \operatorname{dom} f$.

Proof. Let f, g, and $h = g \circ f$ are trans-reloids and $\operatorname{im} f \supseteq \operatorname{dom} g$.

There exist reloids f', g' on some set such that $h \sim g' \circ f'$ and $f' \sim f$, $g' \sim g$.

Obviously $\operatorname{im} f' \supseteq \operatorname{dom} g'$.

$\operatorname{im} h \sim \operatorname{im}(g' \circ f') = \operatorname{im} g' \sim \operatorname{im} g$ (used the theorem 222?? in [4]). □

3 Ordering of filters

Below I will define some categories having filter objects (with possibly different bases) as their objects and some relations having two filter objects (with possibly different bases) as arguments induced by these categories (defined as existence of a morphism between these two f.o.).

Theorem 23. $\operatorname{card} a = \operatorname{card} U$ for every ultrafilter a on U if U is infinite.

Proof. Let $f(X) = X$ if $X \in a$ and $f(X) = U \setminus X$ if $X \notin a$. Obviously f is a surjection.

Every $X \in a$ appears as a value of f exactly twice, as $f(X)$ and $f(U \setminus X)$. So $\operatorname{card} a = U/2 = U$. □

Corollary 24. Cardinality of every two ultrafilters on a set U is the same.

Proof. For infinite U it follows from the theorem. For finite case it is obvious. □

Definition 25. $f * \mathcal{A} = \left\{ C \in \mathscr{P}(\operatorname{Dst} f) \mid \left\langle f^{-1} \right\rangle C \in \operatorname{up} \mathcal{A} \right\}$ for every f.o. $\mathcal{A}$ and a **Set**-morphism f.

Below I'll define some directed multigraphs. By an abuse of notation, I will denote these multigraphs the same as (below defined) categories based on some of these these directed multigraphs with added composition of morphisms (of directed multigraphs edges). As such I will call vertices of these multigraphs objects and edges morphisms.