



Family Set Operations

1 Why

Family set operations are common. TODO: this works for infinite stuff too

2 Definition

We define the set whose elements are the objects which are contained in at least one family member the *family union*. We define the set whose elements are the objects which are contained in all of the family members the *family intersection*.

2.1 Notation

We denote the family union by $\cup_{\alpha \in I} A_{\alpha}$. We read this notation as "union over alpha in I of A sub-alpha." We denote family intersection by $\cap_{\alpha \in I} A_{\alpha}$. We read this notation as "intersection over alpha in I of A sub-alpha."

2.2 Results

Proposition 1. *For an indexed family $\{A_{\alpha}\}_{\alpha \in I}$ in S , if $I = \{i, j\}$ then*

$$\cup_{\alpha \in I} A_{\alpha} = A_i \cup A_j$$

and

$$\cap_{\alpha \in I} A_{\alpha} = A_i \cap A_j.$$

Proposition 2. *For an indexed family $\{A_\alpha\}_{\alpha \in I}$ in S , if $I = \emptyset$, then*

$$\cup_{\alpha \in I} A_\alpha = \emptyset$$

and

$$\cap_{\alpha \in I} A_\alpha = S.$$

Proposition 3. *For an indexed family $\{A_\alpha\}_{\alpha \in I}$ in S .*

$$C_S(\cup_{\alpha \in I} A_\alpha) = \cap_{\alpha \in I} C_S(A_\alpha)$$

and

$$C_S(\cap_{\alpha \in I} A_\alpha) = \cup_{\alpha \in I} C_S(A_\alpha).$$

