



## 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*

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