



## Why

How does the power set relate to a union?

### ℳNotation Preliminaries

Let  $E$  denote a set. Let  $\mathcal{A}$  denote a set of subsets of the set denoted by  $E$ . We define  $\bigcup_{A \in \mathcal{A}} A$  to mean  $\cap \mathcal{A}$ .

## Basic Properties

Here are some basic interactions between the powerset and unions.<sup>1</sup>

**Proposition 1.**  $E^* \cup F^* \subset (E \cup F)^*$

**Proposition 2.**  $\bigcup_{X \in \mathcal{C}} X^* \subset (\bigcup_{X \in \mathcal{C}} X)^*$

**Proposition 3.**  $E = \bigcup E^*$

**Proposition 4.**  $(\bigcup E)^* \supset E$ .

Typically  $E \neq (\bigcup E)^*$ , in which case  $E$  is a proper subset.

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<sup>1</sup>Future editions will expand on these propositions and provide accounts of them.



