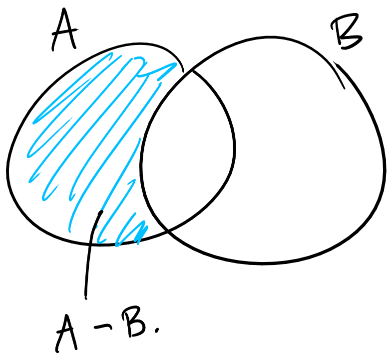
Def'n The difference of two sets A, B is defined as:

$$A - B = \{x \mid x \in A \wedge x \notin B\}$$

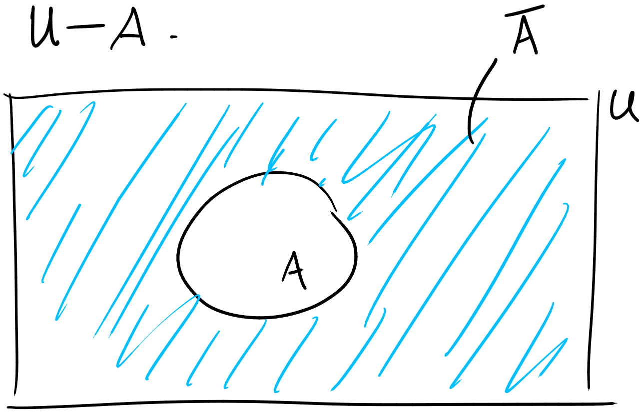
$(A \setminus B)$



Def'n Given a "universe of discourse" U, the complement of a set

A B

$$\overline{A} = U - A.$$



$\cup$, $\cap$, and complement obey some very similar laws as $\vee$, $\wedge$, $\neg$.

e.g.

Thm Intersection distributes over union, that is, for all sets A, B, C,

$$A \cap (B \cup C) = (A \cap B) \cup (A \cap C).$$

Proof. Let A, B, C be arbitrary sets. We will show $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$ by showing $A \cap (B \cup C) \subseteq (A \cap B) \cup (A \cap C)$ and vice versa.

First, we will show $A \cap (B \cup C) \subseteq (A \cap B) \cup (A \cap C)$. Let $p \in A \cap (B \cup C)$; we must show $\boxed{p \in (A \cap B) \cup (A \cap C).}$ want..

know

Since $p \in A \cap (B \cup C)$, it is an element of both, that is, $\boxed{p \in A}$ and $p \in B \cup C$. Likewise, since $p \in B \cup C$, then either $\boxed{p \in B \text{ or } p \in C.}$ know

If $p \in B$, then $p \in A \cap B$ because $p \in A$ also.

If $p \in C$, then $p \in A \cap C$.

In either case, $p \in (A \cap B) \cup (A \cap C)$ since it must be in one or the other.

Next, we must show $(A \cap B) \cup (A \cap C) \subseteq A \cap (B \cup C)$.

(similar).

4. $\overline{S \cup T} = \overline{S} \cap \overline{T}$.