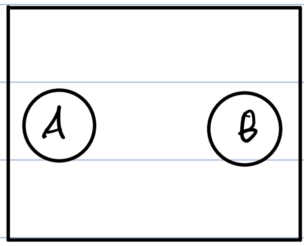
2.2

Disjoint Sets:

2 sets A & B are D.S if $A \cap B = \emptyset$



Huge table ↓

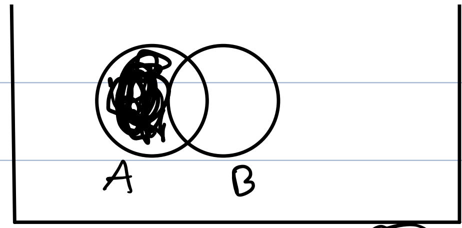
TABLE 1 Set Identities.

Identity	*Name*
$A \cap U = A$ $A \cup \emptyset = A$	Identity laws
$A \cup U = U$ $A \cap \emptyset = \emptyset$	Domination laws
$A \cup A = A$ $A \cap A = A$	Idempotent laws
$\overline{(\overline{A})} = A$	Complementation law
$A \cup B = B \cup A$ $A \cap B = B \cap A$	Commutative laws
$A \cup (B \cup C) = (A \cup B) \cup C$ $A \cap (B \cap C) = (A \cap B) \cap C$	Associative laws
$A \cup (B \cap C) = (A \cup B) \cap (A \cup C)$ $A \cap (B \cup C) = (A \cap B) \cup (A \cap C)$	Distributive laws
$\overline{A \cap B} = \overline{A} \cup \overline{B}$ $\overline{A \cup B} = \overline{A} \cap \overline{B}$	De Morgan's laws
$A \cup (A \cap B) = A$ $A \cap (A \cup B) = A$	Absorption laws
$A \cup \overline{A} = U$ $A \cap \overline{A} = \emptyset$	Complement laws

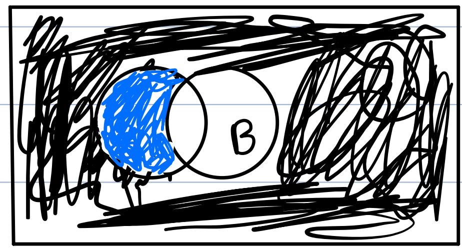
Prove 2 sets are equal:

Prove $A - B = A \cap \overline{B}$

intuition using diagram



2



1 $A \cap \overline{B}$

To prove 2 set are equal: $A \subseteq B$ and $B \subseteq A$

Prove 1 $A - B \subseteq A \cap \overline{B}$

let $x \in A - B$, by definition $x \in A$ and $x \notin B$

Since $x \notin B$, by definition of complement, $x \in \overline{B}$

By def of intersection $x \in A$ and $x \in \overline{B}$, means

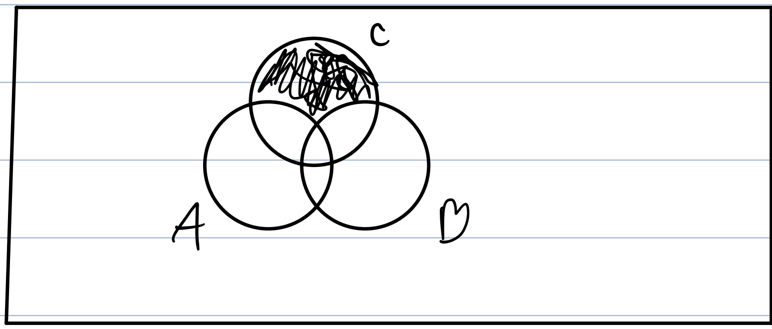
$x \in A \cap \overline{B}$

2 $A \cap \overline{B} \subseteq A - B$. let $x \in A \cap \overline{B}$, by def on intersection

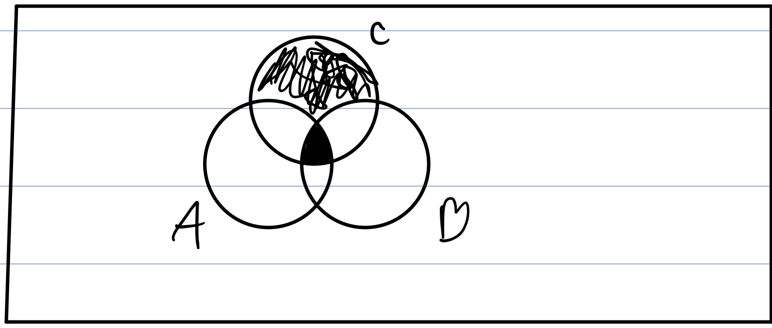
$x \in A$ and $x \in \overline{B}$. Since $x \in \overline{B}$, $x \notin B$, by def of complement

Since $x \in A$, and $x \notin B$, by def $x \in A - B$

Set question



$C-(A\cup B)$



$(C-(A\cup B))-\ldots$

Representation of sets on computers

representing sets using arbitrary ordering

N: only works for finite sets, $\cancel{\mathbb{Z}}$ $\cancel{\mathbb{N}}$

Ex: $U=\{a,b,c,d\}$ → arbitrary ordering $\overset{1010}{abcd}$

To represent $A=\{a,c\}$ → bit string: 1010

$B=\{a,d\}$ → bit string: 1001

$A\cap B: \{a\}$

$$\begin{array}{r} 1010 \\ 1001 \\ \hline 1000 \end{array} \wedge$$

$A\cup B: \{a,c,d\}$

$$\begin{array}{r} 1010 \\ 1001 \\ \hline 1011 \end{array} \vee$$

1011

$\overline{A} = \{b, d\}$ $\qquad$ $\neg 1010 = 0101$