250H Discussion: Set Operations

2/9/26

Set Operations

- Like basic arithmetic operations

- Somewhat analogous to addition and multiplication

Set Union

- For sets A and B, we define A U B as:

$$A \cup B = \{x | x \in A \vee x \in B\}$$

Set Union

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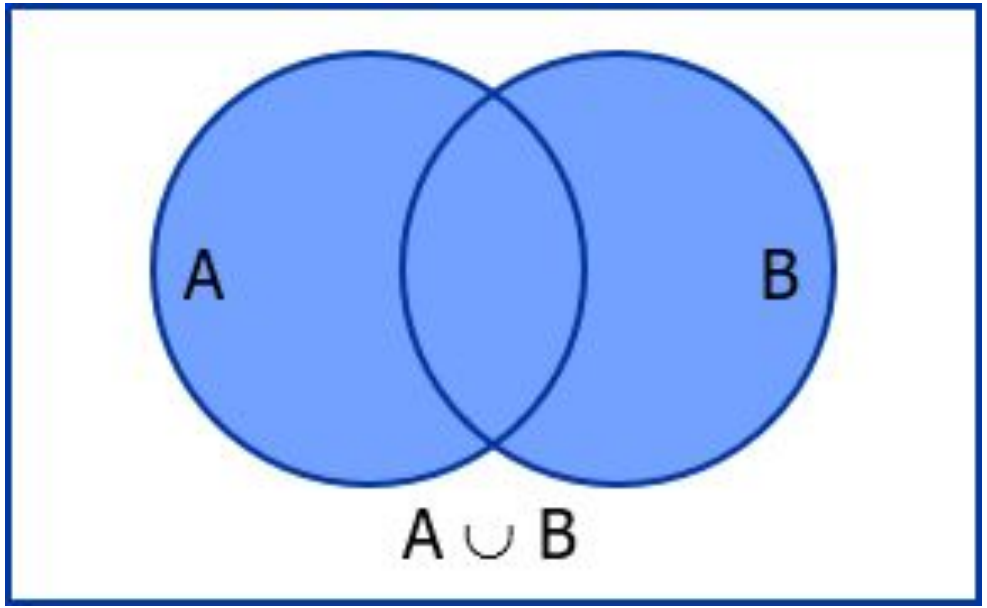
$$A \cup B = \{x | x \in A \vee x \in B\}$$

- Elements are not repeated

Set Union

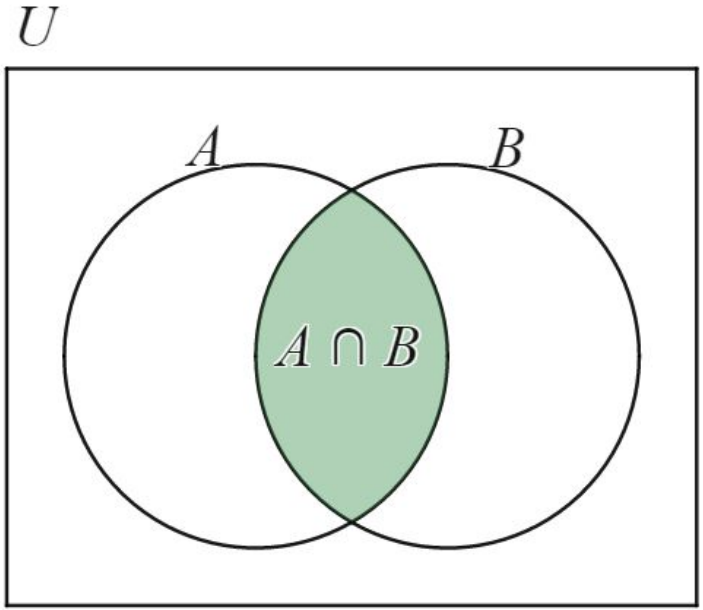


Set Intersection

- Definition:

$$A \cap B = \{x | x \in A \land x \in B\}$$

Set Intersection



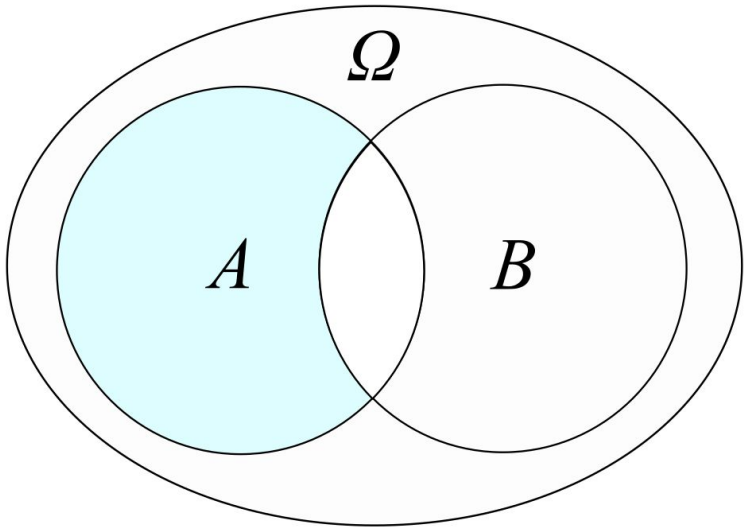
Set Subtraction

- Definition:

$$A \setminus B = \{x | x \in A \land x \notin B\}$$

- Can also use A-B

Set Minus



$A \setminus B$ Sann Falsk

De Morgan’s Laws for Sets

- We can also simplify set operations by establishing equivalence
- Negation for sets is known as the complement (not compliment)
- We can do these as proofs, formally
- Venn diagrams also work intuitively

A^C or A'

$$(A \cup B)^C$$

- We want everything that is not in the union of A and B

- What is an equivalent way of writing this?

$$(A \cup B)^C$$

- We want everything that is not in the union of A and B

- What is an equivalent way of writing this?
  - Take everything not in A
  - Take everything not in B

$$(A \cup B)^C$$

- We want everything that is not in the union of A and B

- What is an equivalent way of writing this?
  - Take everything not in A
  - Take everything not in B
  - Take the intersection of this

$$(A \cup B)^C \equiv A^C \cap B^C$$

$$(A \cup B)^C$$

A union B Complement

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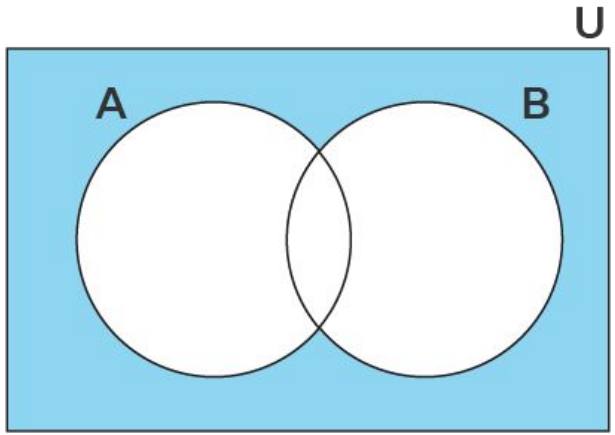


$(A \cup B)'$

$$(A \cap B)^C$$

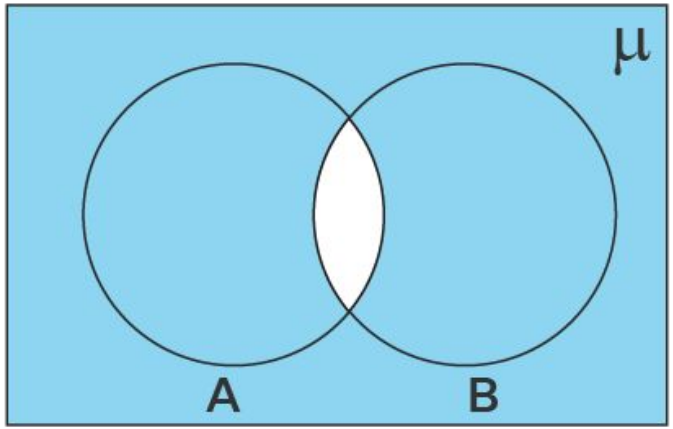
- We want everything not in both A and B

- What is an equivalent way of writing this?
  - Take everything not in both A and B

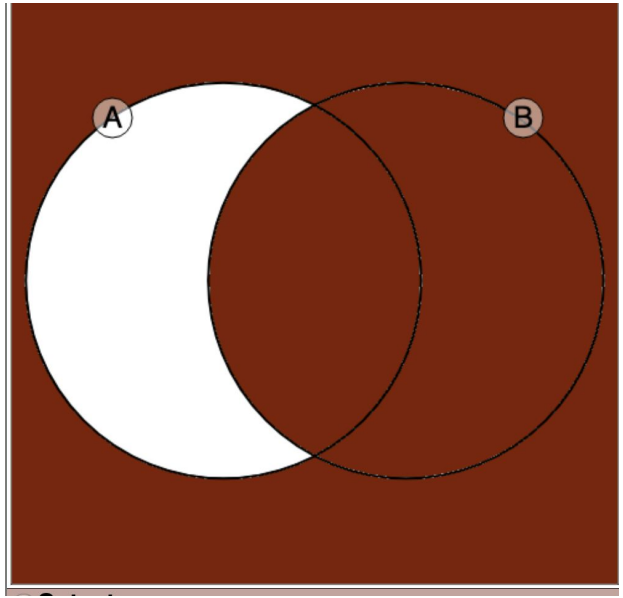
$$(A \cap B)^C \equiv A^C \cup B^C$$

$$(A \cap B)^C$$

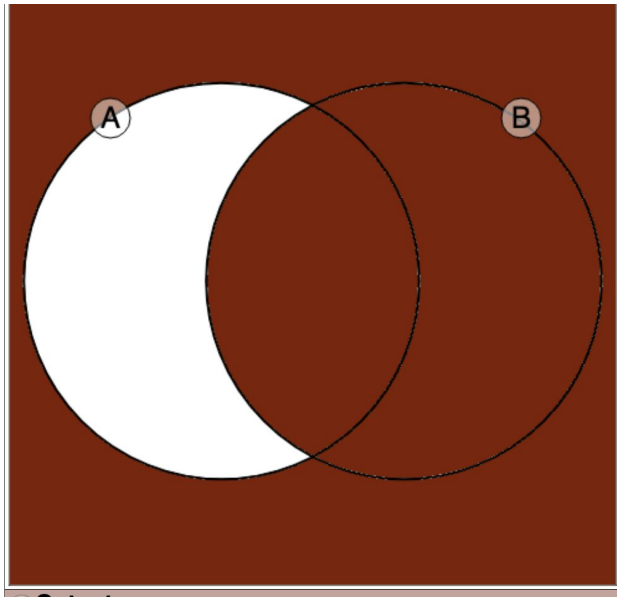
A Complement Union B Complement



$$(A \setminus B)^C$$



$$(A \setminus B)^C$$



$$(A \setminus B)^C \equiv A^C \cup B \equiv A^C \cup (A \cap B)$$