Union, Intersection, and Difference of Sets

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Union

If A and B are sets, the union C of A and B, written $C = A \cup B$, is the set of elements of either A or B or both.

$$A \cup B = \{x : x \in A \text{ or } x \in B\}.$$

$$\{1, 2, 3\} \cup \{3, 5, 6\} = \{1, 2, 3, 5, 6\}$$

Intersection

If A and B are sets, the intersection C of A and B, written $C = A \cap B$, is the set of elements in both A and B.

$$A \cap B = \{x : x \in A \text{ and } x \in B\}.$$

$$\{1, 2, 3\} \cap \{3, 5, 6\} = \{3\}$$

Difference

If A and B are sets, the difference C of A and B, written $C = A - B$, is the set of elements in A but not in B.

$$A - B = \{x : x \in A \text{ and } x \notin B\}.$$

$$\{1, 2, 3\} - \{3, 5, 6\} = \{1, 2\}$$

Example

$A = \{0, 1\}$ and $B = \{1, 2\}$. What is $(A \times B) \cap (B \times B)$?

Example

Let $X = [1, 3] \times [1, 3]$ and $Y = [2, 4] \times [2, 4]$ in $\mathbb{R}^2$. Sketch the sets

- $X \cup Y$
- $X \cap Y$
- $X - Y$
- $Y - X$