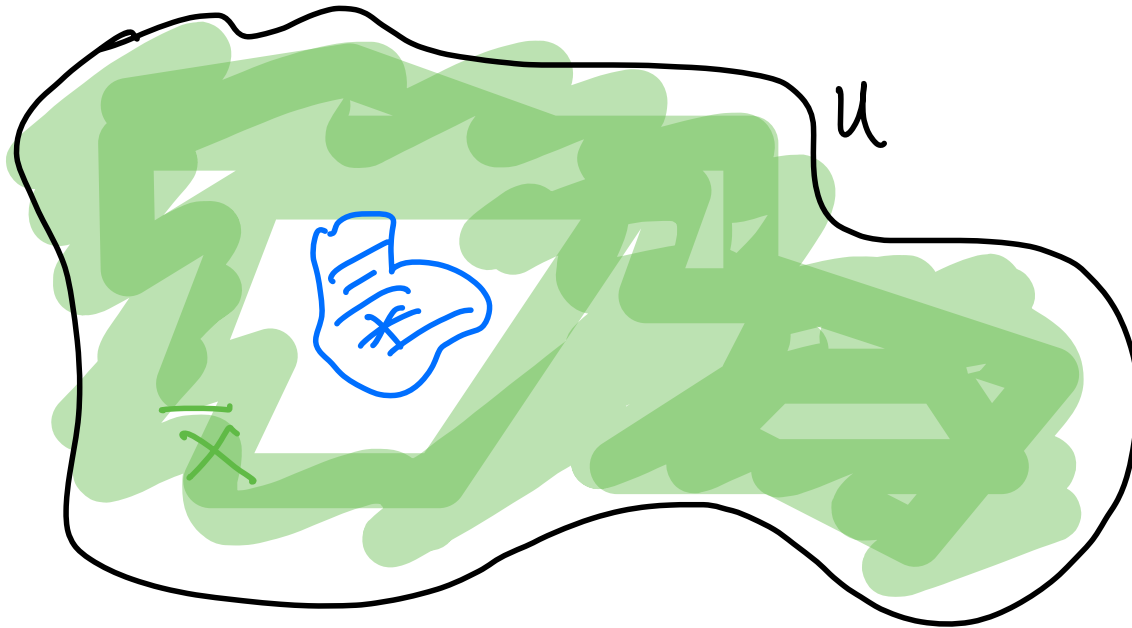


Complement

Complement

Complement

- ▶ The complement of a set is defined when our given set is understood to be a subset of some much larger set called the **universe** or **universal set**.
- ▶ When X is a set and its universal set U is specified (or understood) then the **complement** $\bar{X}$ is the set $U - X$.



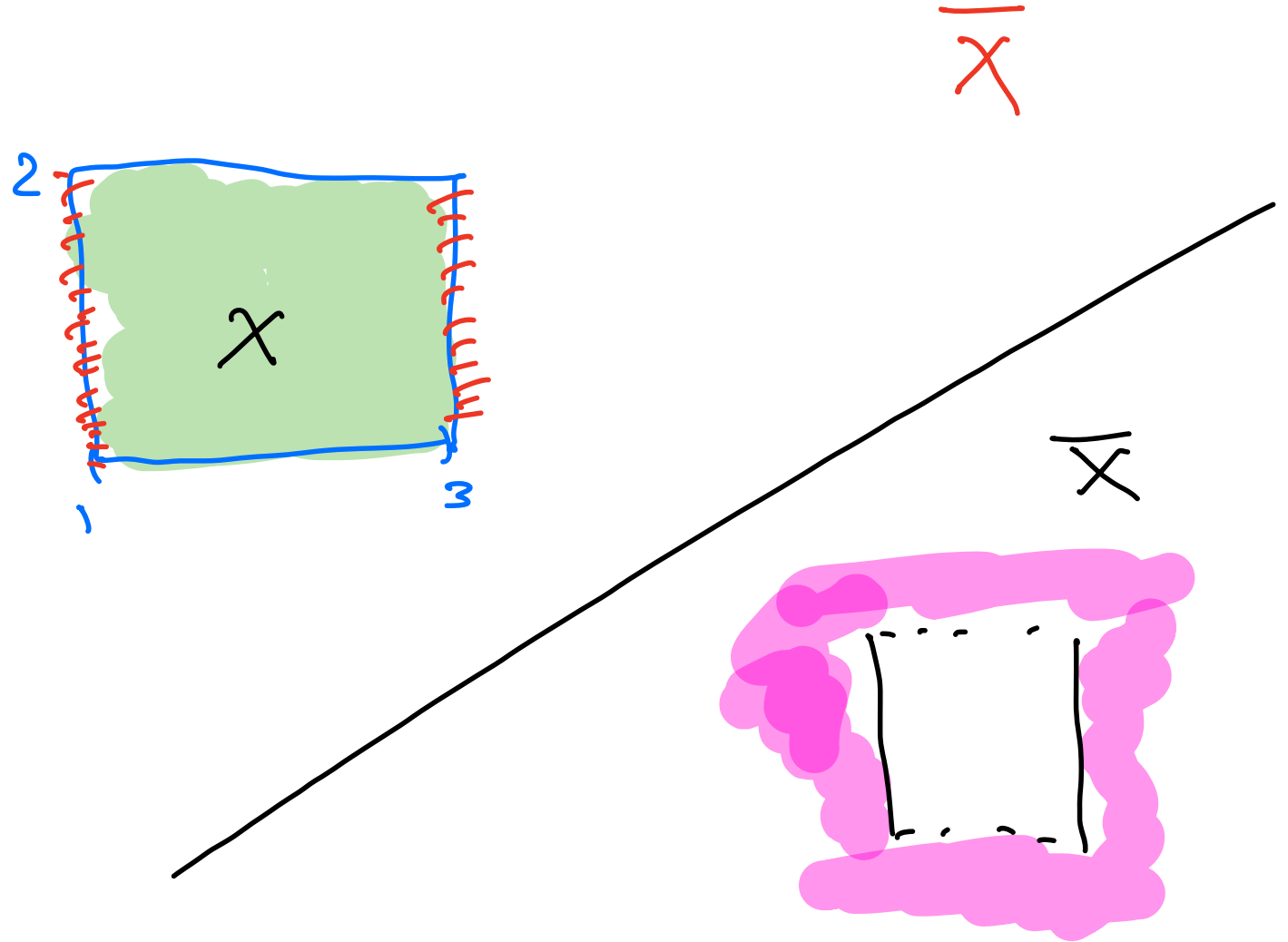
Example

- P is the set of prime numbers, with universal set $U = \mathbb{N}$. What is $\overline{P}$?


$$\overline{P} = \text{composite numbers and } 1 \leq N$$

Example

$X = (1, 3) \times [1, 2]$ in $\mathbb{R}^2$, with universal set $U = \mathbb{R}^2$. Sketch $\overline{X}$.



Example

Suppose:

- ▶ $A = \{x : x \in \mathbb{N}, x \text{ is even and } 0 \leq x \leq 8\} = \{2, 4, 6, 8\}$
- ▶ $B = \{x : x \in \mathbb{N}, x \text{ is odd and } 0 \leq x \leq 8\} = \{1, 3, 5, 7\}$
- ▶ $U = \{x : x \in \mathbb{N}, 0 \leq x \leq 8\}.$

What is $\bar{A} \cap B$?

$$\bar{A} = \{1, 3, 5, 7\}$$

$$B = \{1, 3, 5, 7\}$$

$$\bar{A} \cap B = \{1, 3, 5, 7\}$$
$$= B$$

Example

$X = \{(x, y) \in \mathbb{R}^2 : y < x^2\}$ with universal set $\mathbb{R}^2$. Sketch $\overline{X}$.

