ETH zürich

Discrete Mathematics **2024**

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Assignment 4 **Due date:** Thursday, 17 October 2024, 23:59

Exercise 4.5, Proving/Disproving Set Properties ($\star\star$) (8 Points)

Prove or disprove the following statements.

a) For any sets A, B, C it holds $(A \cup (B \setminus C)) \cap (B \cap C) = \varnothing$

b) For any sets A, B, C it holds $A \cap (B \setminus C) = (A \cap B) \setminus ((A \cap B) \cap C)$

c) For any sets A, B it holds $|\mathcal{P}(\mathcal{P}(B))| \geq 2$

Expectation: Argue using the definitions of $\subseteq, \cup, \cap, |\cdot|, \mathcal{P}(\cdot), \setminus, \times$ from the lecture notes. You are allowed to use any results you have already seen in the lecture, including facts from Chapter 2 (e.g. the rules of Lemma 2.1), as well as $F \vee \bot \equiv F$ and $F \wedge \top \equiv F$. You can apply several rules/results in one step, but have to clearly state which rules/results you apply. To disprove a statement, provide a concrete counterexample.