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FS 2025

Logic and Foundation with Haskell

Exercise sheet 10

Exercise 1. In the lecture, we defined ordered pairs as $\langle x, y\rangle := \{\{x\}, \{x, y\}\}$. Check (by informal proof) that this definition satisfies the characteristic properties of pairs:

$$\langle x, y\rangle = \langle x', y'\rangle \;\Leftrightarrow\; x = x' \wedge y = y'.$$

Exercise 2. Prove the following set theoretic identities (by informal proof):

$$\left(\bigcup_{i\in I} A_i\right) \cap B = \bigcup_{i\in I}(A_i \cap B),$$
$$\left(\bigcap_{i\in I} A_i\right) \setminus B = \bigcap_{i\in I}(A_i \setminus B),$$
$$(A \cap B) \times C = (A \times C) \cap (B \times C)$$
$$(A \cup B) \times C = (A \times B) \cup (B \times C)$$
$$(A_1 \times B_1) \cap (A_2 \times B_2) = (A_1 \cap A_2) \times (B_1 \cap B_2)$$