ETH zürich

Discrete Mathematics **2024**

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Assignment 5 **Due date:** Thursday, 24 October 2024, 23:59

Exercise 5.5, Properties of Relations ($\star$) (8 Points)

Prove or disprove the following claims:

a) A relation ρ on a set A is symmetric on A if and only if ρ^2 is symmetric on A.

b) If ρ is a relation on a set A that is symmetric and antisymmetric, then it musta hold $\rho = \mathsf{id}_A$.

c) Define the relations ρ_1 and rho_2 on $\mathbb{Z}$ as

$$a \,\rho_1\, b \iff b = a + 1, \qquad a \,\rho_2\, b \iff b \equiv_2 a.$$

Then for $\rho = \rho_1 \cup \rho_2$ it holds $\rho^2 = \mathbb{Z} \times \mathbb{Z}$.

a)

The claim is

b)

The claim is

c)

The claim is