

4. (20%) Let \mathbf{N} be the set of all positive integers and R be a relation in $\mathbf{N} \times \mathbf{N}$ such that

$$((a, b), (x, y)) \in R \Leftrightarrow \frac{2a+1}{2^b} \leq \frac{2x+1}{2^y}.$$

Prove that R is a partial order.