Definitions

1.) Given a set P, a partial order on P is a relation $\leq$ on P that satisfies the following conditions:

    1. For all $p \in P$, $p \leq p$. (Reflexivity)

    2. For all $p, q \in P$, $p \leq q \wedge q \leq p \implies p = q$. (Antisymmetry)

    3. For all $p, q, r \in P$, $p \leq q \wedge q \leq r \implies p \leq r$. (Transitivity)

2.) Given a relation R on a set P, R is transitive if for all $p, q, r \in P$, $p \sim q \wedge q \sim r \implies p \sim r$.

3.) The union of a collection of sets $\{S_\alpha\}_{\alpha \in A}$ is defined as the set $S = \{\}$

Proofs

a.) awd