# Homework 2, March 3, 2022

**Answer by complete sentences. Give reasons to all your assertions.**

**Example 1.** Give the properties of the following relation on the set of all natural numbers $\mathbb{N}$:

$$m\,R\,n \quad \text{if and only if } m \cdot n \text{ is even.}$$

**Example 2.** Given two relations $R$ and $S$ on a set $A$. Decide whether it is true:

*If $R$ and $S$ are transitive, then so is $R \circ S$.*

**Example 3.** Consider the set $A$ of all binary words together with the following relation

$$u \sqsubseteq v \quad \text{iff either } |u| < |v| \text{ or } |u| = |v| \text{ and } u \text{ is lexicographicly smaller or equal to } v.$$

Show that $(A, \sqsubseteq)$ is a poset.

Hint: Note that $|u|$ is the length of the binary word $u$, and $u = a_1 a_2 \ldots a_k$ is lexicographically smaller or equal to $v = b_1 b_2 \ldots b_k$ if and only if $a_i \leq b_i$ for every $i = 1, \ldots, k$.