Problem 1
Prove that for a relational structure $\Gamma$ the following is equivalent:

- Every relation $R$ in $\Gamma$ is 2-decomposable, that is, $R$ contains all $n$-tuples $(t_1, \ldots, t_n)$ such that for all $i, j \in \{1, \ldots, n\}$ there is a tuple $s \in R$ such that $t_i = s_i$ and $t_j = s_j$.
- Every relation that is primitive positive definable in $\Gamma$ is definable by a conjunction of binary primitive positive definable relations in $\Gamma$.

Problem 2
For a tree $T$ with a distinguished vertex $v \in V(T)$, consider the structure $(V(T); <, E)$ where

- $E$ is the binary relation that contains all pairs $(x, y)$ such that the distance between $x$ and $v$ is strictly smaller than the distance between $y$ and $v$, and
- $<$ is a linear extension of $E$.

Find such a tree $T$ so that the corresponding structure $(V(T); <, E)$ can not be solved by arc consistency.