Transitive Reduction

We write R^* for the reflexive and transitive closure of R.

The transitive reduction R^- of a transitive relation R is a smallest (it need not be unique) set S such that $S \subseteq R$, and $S^+ = R$.

$$R^- = \{ \langle a, b \rangle \in R \mid \neg \exists c \in A \, [a \neq c \land b \neq c \land \langle a, c \rangle \in R \land \langle c, b \rangle \in R] \}$$

This relation is not always well-defined. For example, what if R is cyclic? Does $\leq_R^-$ exist? R^- is well defined for finite, non-cyclic relations