

CS200 - Problem Set 10

For each of the following relations, either prove it is an equivalence relation, or prove it is not an equivalence relation. If it is an equivalence relation, give an example of an equivalence class.

1. Let T be the set of strings. Then for $s, t \in T$, $(s, t) \in R$ if and only if $s = t$, or s and t each have at least 31 characters, and the first 31 characters of the two strings are the same. (This relation is related to programming languages; in the C programming language, the compiler only looks at the first 31 characters of a variable name.)
2. Let $R \subseteq \mathbb{R} \times \mathbb{R}$. Then for $a, b \in \mathbb{R}$, we have $(a, b) \in R$ if and only if $|a - b| \leq 1$.
3. Let S be the set of all people who have ever lived, and let $R \subseteq S \times S$, where $(a, b) \in R$ if and only if a and b have a common grandparent.
4. Let S be the set of all people who have ever lived, and let $R \subseteq S \times S$, where $(a, b) \in R$ if and only if a and b have the same first name.
5. Let S be the set of all people who have ever lived, and let $R \subseteq S \times S$, where $(a, b) \in R$ if and only if a is the same height or taller than b .