CSE 390z: Mathematics for Computation Workshop

QuickCheck: Relations Solutions (due Tuesday, May 28)

Please submit a response to the following questions on Gradescope. We do not grade on accuracy, so please submit your best attempt. You may either typeset your responses or hand-write them. Note that hand-written solutions must be legible to be graded.

We have created **this template** if you choose to typeset with Latex. **This guide** has specific information about scanning and uploading pdf files to Gradescope.

0. Relations

(a) Consider the relation $R \subseteq \mathbb{Z} \times \mathbb{Z}$ defined by $(a, b) \in R$ iff $a < b$. Determine if R is reflexive, symmetric, antisymmetric, and/or transitive. If the relation has a property, explain why. If not, state a counterexample.

Solution:

- Reflexive: No. For example, $(0, 0) \notin R$.
- Symmetric: No. For example, $(0, 1) \in R$ but $(1, 0) \notin R$.
- Antisymmetric: Yes. Suppose $(a, b) \in R$ and $a \neq b$. Then $a < b$. Then by properties of less than, it is not possible for $b < a$. So $(b, a) \notin R$.
- Transitive: Yes. Suppose $(a, b) \in R$ and $(b, c) \in R$. Then $a < b$ and $b < c$. So $a < c$. So $(a, c) \in R$.

(b) Given an example of a relation that is neither symmetric nor antisymmetric.

Solution:

Consider the relation $R = \{(0, 1), (1, 0), (1, 2)\}$. This is not symmetric, because $(1, 2) \in R$ but $(2, 1) \notin R$. This is also not antisymmetric, because $(0, 1) \in R$ and $(1, 0) \in R$.

1. Video Solution

Watch **this** solution video **after** making an initial attempt. Then, answer the following questions.

(a) What is one thing you took away from the video solution?