CSE 390Z: Mathematics for Computation Workshop

QuickCheck: 2. Equivalence Proof Solutions (due Monday, October 19, 11:59 PM)

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. Equivalence Proof

Use a chain of equivalences to show that the following proposition is a tautology (i.e. always true).

$$((p \wedge q) \vee (p \to (\neg p \wedge r))) \vee p$$

Solution:

$$\begin{aligned}
((p \wedge q) \vee (p \to (\neg p \wedge r))) \vee p &\equiv ((p \wedge q) \vee (\neg p \vee (\neg p \wedge r))) \vee p && \text{Law of Implication} \\
&\equiv (p \wedge q) \vee ((\neg p \vee (\neg p \wedge r)) \vee p) && \text{Associativity} \\
&\equiv (p \wedge q) \vee (((\neg p \wedge r) \vee \neg p) \vee p) && \text{Commutativity} \\
&\equiv (p \wedge q) \vee ((\neg p \wedge r) \vee (\neg p \vee p)) && \text{Associativity} \\
&\equiv (p \wedge q) \vee ((\neg p \wedge r) \vee (p \vee \neg p)) && \text{Commutativity} \\
&\equiv (p \wedge q) \vee ((\neg p \wedge r) \vee T) && \text{Negation} \\
&\equiv (p \wedge q) \vee T && \text{Domination} \\
&\equiv T && \text{Domination}
\end{aligned}$$

1. Video Solution

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

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