CSE 390Z: Mathematics for Computation Workshop

QuickCheck: Predicate Logic and English Proofs Solutions (due Monday, October 23)

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. How Odd!

Let Odd(x) be defined as $\exists y\ (x = 2y + 1)$. Let the domain of discourse be the set of all integers.

(a) Translate the following statement into English.

$$\forall x\ \forall y\ ((\text{Odd}(x) \land \text{Odd}(y)) \rightarrow \text{Odd}(xy))$$

Solution:

The product of two odd integers is odd.

(b) Prove the statement from part (a) using an *English proof*.

Solution:

Let x and y be arbitrary odd integers. Then by definition of odd, there exists some integer k such that $x = 2k + 1$. Similarly, if y is odd, there exists some $l \in \mathbb{Z}$ such that $y = 2l + 1$. Multiplying those expressions gives us: $xy = (2k + 1)(2l + 1) = 4kl + 2k + 2l + 1$. Let $a = 2kl + k + l$. a is an integer because the integers are closed under addition and multiplication, so $xy = 2a + 1$. By definition of odd, xy is odd. So, for any integers x, y, if x and y are odd, xy is odd.

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?

(b) What topic from the quick check or lecture would you most like to review in workshop?