CSE 390Z: Mathematics for Computation Workshop

QuickCheck: English Proofs Solutions (due Monday, January 29)

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!

Prove the following statement using an English proof:

For any two integers, if exactly one of them is odd, then their sum is odd.

Hint: You may find proof by cases useful for this problem.

Solution:

Let x and y be arbitrary integers where exactly one is odd. Then, there are two cases.

Case 1: x is odd and y is even.

Then, by definition of odd, there exists an integer k such that $x = 2k + 1$. By definition of even, there is an integer j such that $y = 2j$. So, $x+y = 2k+1+2j = 2(k+j)+1$. Under closure of addition and multiplication, $k + j$ is an integer. So, $x + y$ is odd by definition of odd.

Case 2: x is even and y is odd.

Then, by definition of even, there exists an integer k such that $x = 2k$. By definition of odd, there is an integer j such that $y = 2j + 1$. So, $x + y = 2k + 2j + 1 = 2(k + j) + 1$. Under closure of addition and multiplication, $k + j$ is an integer. So, $x + y$ is odd by definition of odd.

In both cases, the sum of $x+y$ is odd. Since x and y were arbitrary, this proves that for any two integers where exactly one of them is odd, their sum is odd.

1. Video Solution

Watch the videos on the solution **after** making an initial attempt. The video is split into two parts, **part 1** and **part 2**. 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?