Class 2: Proof Methods

Schedule

Before **Friday, 6:29pm**:

– Read, print, and sign the Course Pledge. You should print the PDF version for signing, and submit a scan of your signed pledge as a PDF file using Collab.

– Read Jeremy Kun's *Habits of Highly Mathematical People*.

– Submit a Course Registration Survey (which includes some questions based on Kun's essay).

Next week:

– Before Tuesday's class: Read MCS Chapter 2
– Before Thursday's class: Read MCS Chapter 3
– Due Friday at 6:29pm: **Problem Set 1** (now posted)

Notes and Questions

Contrapositive Inference Rule

$$\frac{P \implies Q}{NOT(Q) \implies NOT(P)} \qquad \frac{NOT(Q) \implies NOT(P)}{P \implies Q}$$

Theorem to Prove: If the product of x and y is even, at least one of x or y must be even.

An integer, z, is **even** if there exists an integer k such that $z = 2k$. Is this a *definition*, *axiom*, or *proposition*?

An integer, z, is **odd** if there exists an integer k such that $z = 2k + 1$. (Note that there is no connection between the variables used here, and to define even above.)

To prove an implication, $P \implies Q$:

1. assume P.

2. Show chain of logical deductions that leads to Q.

Thinking implies disagreement; and disagreement implies nonconformity; and nonconformity implies heresy; and heresy implies disloyalty—so, obviously, thinking must be stopped.
Adlai Stevenson, A Call to Greatness (1954)

Odd-Even Lemma: If an integer is not even, it is odd. Note: A *lemma* is just a name for a theorem, typically used for proving another theorem.

How should one decide what can be accepted as an axiom, and what must be proven?

What is the purpose of a *proof*? (in cs2102? in software development? in algorithm design?)

Why do meaningful digital signatures require discrete mathematics?

In physics, your solution should convince a reasonable person. In math, you have to convince a person who's trying to make trouble. Frank Wilczek