Intro to
Homotopy Type Theory

Three for One

Homotopy

Intro to Homotopy Type Theory, No. 1

Three for One

2 Homotopy

Goal: Mathematical account of space

Problem: Math is based on *sets*, but sets aren't spatial!

Example: Topological spaces

Topological space:

- (X, τ) where $\tau \subseteq \mathcal{P}(X)$, satisfying axioms...
- $(X, \tau) = \{X, \{X, \tau\}\} \in \mathcal{P}(\mathcal{P}(X) \cup \mathcal{P}(\mathcal{P}(X) \cup \mathcal{P}(\mathcal{P}(X))))$
- Set of subsets is space?
- It gets much more elaborate...

The point

- Reasoning about space using set-based math is hard because sets aren't natively spatial
- The types of HoTT *will* be natively spatial (via the Homotopy interpretation)

Spaces

This gets complex, fast. . .

Homotopy Interpretation of HoTT:

Types are spaces

Terms are points

$t : T$ means t is a point in the space T

$\mathbf{1}$ as a space

Contractible: Can be collapsed into a single point

(so no holes, no empty cavities, etc.)

Spaces are weird. They take some getting used to!