WYSIWYG and WYSIWYM

- KaTeX and WeTeX
- Backslash macros
- Menu and Macro Objects
- Functions and keyboard short-cuts
Content vs Form

• Computable math (content MathML)
• Presentation math (LaTeX)
• Can we do both?
Contradictions in real life

- Left & Right symmetry
- Spherical symmetry of earth
- Electrical and Nuclear forces – David and Goliath
Classical logic and the blow-up

- A and -A true ==> B is true (blow-up)
- Paraconsistency logic
Finite and Infinity

- Zeno’s paradox
- Number of points in (0,1) is infinite, but it is of finite length (= 1)
- Countable infinity, rational numbers
- Real numbers are uncountable
- Cantor set
- Transcendental numbers
Uncountability of Real numbers

\[ a_i \in (0,1): \]
\[ a_1 = 0.010010001000\ldots \]
\[ a_2 = 0.01010010101\ldots \]
\[ a_3 = 0.100100101011\ldots \]

\[ \ldots \]

Cantor diagonalization:
\[ b = 0.101\ldots \]
\[ b \notin \{a_1, a_2, a_3, \ldots \} \]
\[ C = 2^\mathcal{H} \]

- \( x = 0.010101001110 \ldots \)
- \( X = \{2,4,6,9,10,11,\ldots\} \)
- \( F: x \rightarrow X \)
- \( F \) is a bijective mapping from \((0,1)\) to \(2^\mathcal{H}\)
- Hierarchy of infinities: \(\mathcal{H}, 2^\mathcal{H}, 2^{2^\mathcal{H}}, \ldots\)
Classical Hegelian contradictions

- Contradiction, synthesis and hierarchy
- Finite and Infinite
- Hierarchy of infinities
Scaling dimension and Cantor set

- Keep removing middle one-third iteratively
- \(3^n = 2\)
- Scaling dimension of cantor set
- \(n = \log_2 / \log_3\)
- \(0 < n < 1\)
- Uncountable since it \(\{0,2\}\) instances of a tredecimal representation of \((0,1)\)
- \(0.02002022002...\) (uncountable)
Complexity and Solvability

- Algorithms $\iff$ Natural numbers
- Decision problems $f: \mathbb{N} \rightarrow \{0, 1\}$ (binary real number)
- Algorithms are countable (Turing number)
- Decision problems uncountable
- Rational numbers are dense in Real numbers (contradiction)
Complexity and Solvability

- Algebraic irrationals (solutions of polynomials with rational co-effecients).
- Yes, there is an infinity between $\mathcal{H}$ and $2^\mathcal{H}$
- NP = P? No!
- Second-order phase transitions
- Iterative functions and Neural networks
- Unreasonable effectiveness of Neural networks
- Transcendental numbers and NP-hard problems