Proof that P ≠ NP

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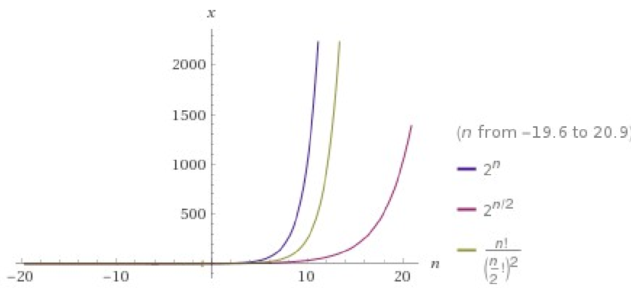
Abstract

A problem exists that’s hard to solve but easy to verify a solution for.

Part 1: proof M runs in superpolynomial time

$\exists H\ \forall A\ [ah \in H(A) \Leftrightarrow ah \subseteq A \wedge |ah| = |A| / 2]$

- note: H(A) is every possible half of A
- note: $|H(A)| = O(|A|! / (|A| / 2)!^2)$
- note: $O(|A|! / (|A| / 2)!^2)$ is superpolynomial



$\exists F\ \forall A\ \forall ah \in H(A)\ \forall x \in ah\ [x = x\ \&\ F(ah)]$

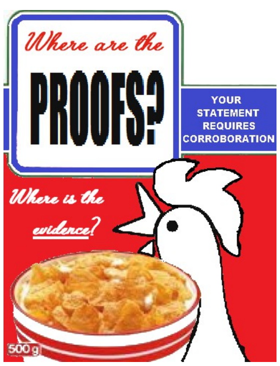
- note: F(ah) is ah folded over the bitwise and operation

$\exists$deterministic polynomial time Turing machine V $\forall A\ \forall ah \in H(A)\ \forall B\ \forall bh \in H(B)\ [V(ah, bh) = (F(ah) = F(bh))]$

$\exists$deterministic Turing machine M $\forall A\ \forall B\ [M(A, B) = \exists ah \in H(A)\ \exists bh \in H(B)\ [V(ah, bh)]]$

- note: V verifies M

$\exists A$ [M iterates over H(A)]



Ordering A does not order H(A) by F(ah)

- note: F(ah) could fold ah over the bitwise or operation or the bitwise exclusive or operation to the same effect

By definition, it’s impossible for a deterministic Turing machine to search an unordered set without iteration

$\exists A$ [M iterates over H(A)] $\Rightarrow$ M runs in superpolynomial time

Part 2: proof $P \neq NP$

$\exists L \subseteq \{0, 1\}$ [$\forall w \in L$ [M accepts parsed w]]

M runs in superpolynomial time $\wedge \forall w \in L$ [M accepts parsed w] $\Rightarrow$ $L \notin P$

V runs in polynomial time $\wedge$ V verifies M $\wedge \forall w \in L$ [M accepts parsed w] $\Rightarrow L \in NP$

$L \notin P \wedge L \in NP \Rightarrow P \neq NP$