Collatz Conjecture Proof (Work in Progress)

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preface:

$0 \in \mathbb{N}$

$a \bmod_k b \equiv a - b \left\lfloor \frac{a}{b} \right\rfloor + k$

$a \bmod b \equiv a \bmod_0 b$

pf:

let $n, m, k, p \in \mathbb{N}, \quad f(x) = \begin{cases} 3x + 1, \;\; x \bmod 2 \equiv 1 \\ \frac{x}{2}, \;\; x \bmod 2 \equiv 0 \\ \text{undef, otherwise} \;\; (x \notin \mathbb{Z}) \end{cases}$

$\log_2 x \in \mathbb{N} \iff 1$ is reached after $\log_2 x$ iterations.

$3^p n \neq 2^k \forall n \neq 2^m$

therefore multiplying by 3 has no effect on the ability to reach 2^n.

neither does dividing by 2.

$3n + 1 \stackrel{?}{=} 2^k \wedge 3n + 2 \stackrel{?}{=} 2^k \therefore$ adding does have an effect.

$|\mathbb{N}| = \infty \iff \left|2^{\mathbb{N}}\right| = \infty$ (there are infinite 2^ns.)

one of the 2^ns will always be reached because iterating through f will add 1 every time it is odd.

$\blacksquare$?

footnotes:

will only prove for $x \in \mathbb{N}$.

the formulas for f or mod have to change for $x \in \mathbb{I}, \mathbb{C}$

ie: $3i \bmod 2 = i \notin \{1, 0\}$.

the conjecture does not hold $\forall x \in -\mathbb{N}$ because $x = -5$ loops.