

Collatz conjecture is false if 0 is natural number

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Abstract: I showed Collatz conjecture is false if 0 is natural number

definition 1: set of even number is E , set of odd number is O ,
set of natural number is N .

than $(E, O) \in N$

$$n \in E \text{ iff } \frac{n}{2} \in N (n \in N)$$

$$m \in O \text{ iff } \frac{m}{2} \notin N (m \in N)$$

$$T(n) = \begin{cases} n \in E \rightarrow \frac{n}{2} \\ n \in O \rightarrow 3n + 1 \end{cases}$$

$T^a(n) = m \Leftrightarrow$ recursively repeat n to $T(n)$ a times, than derived m
 $(a, n) \in N$, ex. ($T^5(10) = 2$, $T^3(8) = 1$)

theorem: Collatz conjecture is false

proof: define set of natural number $N[1]$

$$0 \in N$$

$$\exists n \in N \rightarrow n^+ \in N$$

$$(n, m) \in N, n^+ = m^+ \rightarrow n = m$$

$$n^+ = 0 \rightarrow n \notin N$$

$$S \in N, 0 \in S, \exists n \in S, n^+ \in S \rightarrow S = N$$

$$n + 0 = n$$

$$n * 0 = 0$$

$$n + 0^+ = (n + 0)^+ = n^+$$

$$\frac{0}{2} = 0 \in N \rightarrow 0 \in E$$

$$0 = T(0) \rightarrow T^a(0) = 0 \text{ for } \forall a \in N$$

References

[1] G. peano, Arithmetices principia, nova methodo exposita (1879)(p.83-97)