THE COLLATZ CONTINUUM

by Carter Thiel

Simplification of the Collatz Continuum:

If 3n+1 is performed *properly,* every odd number it produces has an even input and an even output but not every even number has an odd input and odd output. Accordingly, more than half of numbers produced by 3n+1 must be even. Half of all numbers are odd and half are even. It would seem that the Collatz conjecture is not satisfied by some numbers and therefore is false. However, this also means that *any* set of numbers not satisfying the conjecture has to contain more odd numbers than even numbers and not every odd number would have an even input and an even output. Any system producing a set of these "non-Collatz satisfying" numbers would be inconsistent and erroneous, it would not be performing 3n+1 properly. Therefore the Collatz conjecture *must* be true. [1]

Rigorous Explanation of the Collatz Continuum:

Multiplying a multi-digit number by a single digit number is the same as individually multiplying each digit in the multiplicand with the rest of the digits in the number replaced with zeros by the single digit multiplier and then adding the results together. For example:

4,587 × 3 = 13,761

4,000 × 3 = 12000
500 × 3 = 1500
80 × 3 = 240
7 × 3 = 21

1,2000 + 1,500 + 240 + 21 = 13,761

Therefore the digit in the ones place of the multiplicand is the only digit that affects the digit in the ones place of the product.

Any single digit odd number when multiplied by 3 produces a number with an odd digit in the ones place.

$1 \times 3 = 3$
$3 \times 3 = 9$
$5 \times 3 = 15$
$7 \times 3 = 21$
$9 \times 3 = 27$

The only digit that determines whether a number is odd or even is the digit in the ones place.

If the digit in the ones place of the multiplicand is the only digit that affects the digit in the ones place of the product, any single digit odd number when multiplied by 3 produces a number with an odd digit in the ones place, and the only digit that determines whether a number is odd or even is the digit in the ones place, then any number multiplied by 3 produces an odd number.

Any odd number plus 1 produces an even number.

If any number multiplied by 3 produces an odd number and any odd number plus 1 produces an even number, then any odd number multiplied by 3 and then added to 1 produces an even number.

If any odd number multiplied by 3 and then added to 1 produces an even number, then any odd number minus 1 divided by 3 cannot produce an odd number.

The Collatz conjecture states that if you make sequences where if the previous term is odd the next term is 3 times the previous term added to 1, and if the previous term is even the next term is half of the previous term, every sequence with these rules eventually goes to 1, and any sequence with these rules that does not go to 1 proves the Collatz conjecture false.

Making the sequences in reverse starting at 1 produces the tree of every positive integer that satisfies the Collatz conjecture.

If the Collatz conjecture states that if you make sequences where if the previous term is odd the next term is 3 times the previous term added to 1, and if the previous term is even the next term is half of the previous term, every sequence with these rules eventually goes to 1, and any sequence with these rules that does not go to 1 proves the Collatz conjecture false, and if making the sequences in reverse starting at 1 produces the tree of every integer that satisfies the Collatz conjecture, then it is the case that if the tree of every integer that satisfies the Collatz conjecture does not contain every integer the Collatz conjecture is therefore false.

If any odd integer multiplied by 3 and then added to 1 produces an even integer and any odd integer minus 1 divided by 3 cannot produce an odd integer, then every odd integer produced by the tree of every integer that satisfies the Collatz conjecture must be produced by an even integer and produce an even integer.

Some even integers divided by 2 produce even integer.

$12 / 2 = 6$

If some even integers divided by 2 produce an even integer then the tree of every integer that satisfies the Collatz conjecture produces some even integers from even integers.

Any even integer plus one produces an odd integer.

0 cannot be odd or even.

If any odd integer plus 1 produces an even integer, if any even integer plus one produces an odd integer, and if 0 cannot be odd or even, then every other positive integer is odd and every other positive integer is even.

If every other positive integer is odd and every other positive integer is even then every positive integer is either odd or even.

If every positive integer is either odd or even, then any container that can be made can only either hold an even number of integers or an odd number of integers.

1 is an odd integer.

If every other positive integer is odd and every other positive integer is even, and if 1 is an odd integer, then any container containing an even number of integers also contains the same number of even integers as odd integers.

If every other positive integer is odd and every other positive integer is even, and if 1 is an odd integer, then any container containing an odd number of integers also contains one more odd integers than even integers.

If every odd integer produced by the tree of every integer that satisfies the Collatz conjecture must be produced by an even integer and produce an even integer, the tree of every integer that satisfies the Collatz conjecture produces some even integers from even integers, and every other positive integer is odd and every other positive integer is even, then the tree of every integer that satisfies the Collatz conjecture produces more even integers than odd integers.

If any container that can be made can only either hold an even number of integers or an odd number of integers, if any container containing an even number of integers also contains the same amount of even integers as odd integers, and if any container containing an odd number of integers also contains one more odd integer than even integers, then any container containing every integer could not possibly contain more even integers than odd integers.

If the tree of every integer that satisfies the Collatz conjecture produces more even integers than odd integers and any container containing every integer could not possibly contain more even integers than odd integers, then the tree of every integer that satisfies the Collatz conjecture cannot possibly contain every integer.

If it is the case that if the tree of every integer that satisfies the Collatz conjecture does not contain every integer the Collatz conjecture is therefore false, and the tree of every integer that satisfies the Collatz conjecture cannot possibly contain every integer, then the Collatz conjecture therefore must be false.

If every other positive integer is odd and every other positive integer is even, and if the tree of every integer that satisfies the Collatz conjecture produces more even integers than odd integers, then any container containing integers that do not satisfy the Collatz conjecture must contain more odd integers than even integers.

If the Collatz conjecture states that if you make sequences where if the previous term is odd the next term is 3 times the previous term added to 1, and if the previous term is even the next term is half of the previous term, every sequence with these rules eventually goes to 1, and any sequence with these rules that does not go to 1 proves the Collatz conjecture false, then for the Collatz conjecture to be false there must be a sequence that cannot go to 1 and it must have the same rules as the sequences that do go to 1.

If every odd integer produced by the tree of every integer that satisfies the Collatz conjecture must be produced by an even integer and produce an even integer, if any container containing integers that do not satisfy the Collatz conjecture must contain more odd integers than even integers, and if it is the case that for the Collatz conjecture to be false there must be a sequence that cannot go to 1 and it must have the same rules as the sequences that do go to 1 then it is the case that any container containing integers that do not satisfy the Collatz conjecture does not have the same rules as the sequences that satisfy the Collatz conjecture and cannot make the Collatz conjecture false.

If any container containing integers that do not satisfy the Collatz conjecture does not have the same rules as the sequences that satisfy and cannot make the Collatz conjecture false, then the Collatz conjecture must be true.

This also means that any completion of the infinite set would be inconsistent, it will not only be *possible* to have a new number, it *should* have a new number if we are applying the rules of the Collatz conjecture. This is similar to Cantor's "diagonal" argument and his proof of the inconsistency of the absolute infinity. [2] Except this proof shows that all infinities have the same size.

Base: 2 Index:2

10
01

Cantor's diagonal argument says we *could* make another number "00" so it *would* be *possible* for the base and index to contain another number, therefore we *should* make another number if we are counting. Obviously the diagonal argument is just a visual representation of the fact that the size of the index is always logarithmic in relation to the power. [2]

10
01
11

The "vertical argument" states that we *would* make another number with Base: 2 Index: 3 from "101" or "011". If one has written the list above they have *necessarily* written the list below. If we are counting we *should* count all *possible* numbers we can make from our base and index.

101
011

This process can be cyclically repeated infinitely, and even works for natural numbers. Infinity shall be named “ԃ”.

1
2
…
10
…
100
…
ԃ

Since the index is always logarithmic to the power then the vertical argument would make a number with a larger index. We can visually see the natural numbers are uncountable because a list (which is how you count) of them *would* require writing a number larger than the largest number, this would happen the number after $\log_{10}$(ԃ). This behavior shall be called “teleonomy”. Diagonal teleonomy simply means we are in the realm of possibility (*could*) and only when we achieve certainty indirectly do we come to rest at horizontal teleonomy, which is reinforced (*should*). Vertical teleonomy being enforced (*would*), never enters the realm of possibility, it is initially and eternally in the realm of certainty. Like a long object with two forces perpendicular to the surface below it moving in both directions, the strength of these forces changing very randomly and drastically, and a third force attracting the object to the surface like gravity eventually overpowering the other two at a close enough range to the surface. *Should* is certain, but not the same as *would* which is stronger because we added no new rules. These proofs are “teleonomic proofs” of their type. This is a vertical teleonomic proof for the continuum hypothesis being false, at ԃ we actually made a set of numbers with a cardinality greater than the natural numbers and less than the real numbers [3]. It is also a horizontal teleonomic proof that all infinities are absolutely infinite, they should all be the same size but also have some difference between them, the relative size of the units making their bases called “monads”. The only way we can express infinities is by a relation between ԃ and another number, similar to the imaginary unit.

Notes:

I was in the middle of writing a full paper about the implications of these discoveries and it became apparent that the time I would need to complete the paper properly would be far out of the scope of how long I wanted to wait to announce the discoveries. Here is an SHA-512 hash output of the current state of the paper and another of some notes as proof. More hashes will be posted periodically as edits and additions until the full paper is released.

6FA238D36B958C4CEE4A858A9278A7BD5BE314FF7984EE093B7AAE3B28EA736054A6939597AF748235BAD1CBDDF82C39AFF0F46E5E8048D3FCCCF8955743B8F2

574956BF963986EAC3648BC0092B1B7A41B7540A7B8212533172F2086DDF9FA993F362176686DDBA7A798A1C305CB163419D5553B304B91134FD74C1E46083C8

References

[1] Jan Kleinnijenhuis, Alissa M. Kleinnijenhuis, and Mustafa G. Aydogan: “The Collatz tree as a Hilbert hotel: a proof of the 3x + 1 conjecture”. arxiv.org/abs/2008.13643 [math.GM] (10 Dec 2021)

[2] Georg Cantor: "Ueber eine elementare Frage der Mannigfaltigkeitslehre". (1891)

[3] Georg Cantor: "Ein Beitrag zur Mannigfaltigkeitslehre". (1878)

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