

Given  $i = (-1)^{1/2}$  and lower case Zeta (Z) as  $\zeta$  (lc\_case zeta):

1. For **any** complex number  $(a + bi)$ ,  $\zeta(a + bi)$  is another complex number  $(c+di)$ .
2. A zero is a point  $(a + bi)$  where  $f(a + bi)=0$ , such as for example  $\zeta(0)=0$ .
3. Trivial zeroes occur at  $(0 + bi)$  for **some**  $b$ .

Hence if  $a$  and  $c = 0$ , then  $\zeta(a + bi)$  is rewritten in  $\zeta((0) + bi)$  as another complex number  $((0)+di)$ .

4. Non trivial zeroes occur at  $(1/2 + bi)$  for **some**  $b$ .

Hence, if  $a$  and  $c = 1/2$ , then  $\zeta(a + bi)$  is rewritten in  $\zeta((1/2) + bi)$  as another complex number  $((1/2)+di)$ .

A sentence to test is if known zeroes imply other zeroes:

Trivial zeroes  $\zeta((0) + bi)$  for **some**  $b$ , implying other complex numbers as **all**  $((0)+di)$ , and non trivial zeroes  $\zeta((1/2) + bi)$  for **some**  $b$ , implying other complex numbers as **all**  $((1/2) + di)$ , imply possibly other zeroes  $\zeta(a + bi)$  for **some**  $b$ , implying other complex numbers as **all**  $(a + di)$ . (5.0)

This effectively tests if a location of zeroes (trivial based on even numbers) and a location of zeroes (non trivial based on odd numbers) imply another possible location of zeroes as a tautology, because the question is "Are there possibly other zeroes".

We assume the apparatus of the Meth8 modal logic model checker implementing variant system VL4. Meth8 allows us to mix four logical values with four analytical values. The designated proof value is T.

Definition	Axiom	Symbol	Name	Meaning	2-tuple	Ordinal
1	$p=p$	T	Tautology	proof	11	3
2	$p@p$	F	Contradiction	absurdum	00	0
3	$\%p>\#p$	N	Non-contingency	truth	01	1
4	$\%p<\#p$	C	Contingency	falsity	10	2

LET: + Or; & And; \ Not and; > Imply; < Not imply; @ Not equivalent to;  
 # all; % some; (p@p) 00, zero ; (%p<#p) 10, two ; (%p>#p) 01, one;  
 pqrs  $bd\zeta i$  ; (p@p) trivial  $a,c$  as (0) ; ((%p>#p)\(%p<#p)) non trivial  $a,c$  as (1/2);

Results are the proof table of 16-values in row major horizontally.

$$(((r\&\#((p@p)+(\%q\&s)))>(p@p))>(p@p)) \& (((r\&\#(((\%p>\#p)\(\%p<\#p))+(\%q\&s)))>(p@p))) > \%(r\&\#(p+(\%q\&s)))>(p@p)) ; \quad \begin{matrix} TTTT & TTTT & TTTT & TTTT \end{matrix} \quad (5.1)$$

Eq. 5.1 shows other zeroes are possible. We conclude that the Riemann hypothesis, as stated and rendered, is *not* tautologous, and hence is denied.