

## Numbers that are equal to its inverse other than $\pm 1$

Is there a number whose inverse is equal to the number itself?

The answer to that question is a surprising yes. These are complex numbers that fit the formula  $\frac{1}{n * n^{(1+n*n*i)}}^{\wedge} ((1 + n * n * i))$  which, when raised to -1, continue to give the same result:

$$\frac{1}{n * n^{(1+n*n*i)}} = \left( \frac{1}{n * n^{1+n*n*i}} \right)^{-1} = \text{real}(-i * -1) \text{ True}$$

Examples:

$$(1/98*98^{(1+98*98*i)}) = 0.10556682 + 0.994412212 i$$

$$(1/98*98^{(1+98*98*i)})^{-1} = 0.10556682 - 0.994412212 i$$

But they no longer respect the squeeze theorem as it is the case for  $\frac{1}{n*n^{\frac{1}{2}+n*n*i}} = \sin\left(\frac{1}{n*n^{\frac{1}{2}+n*n*i}}\right)$  or  $\left(\frac{1}{n*n^{\frac{1}{2}+n*n*i}}\right)^{-1} = \sin\left(\frac{1}{n*n^{\frac{1}{2}+n*n*i}}\right)^{-1}$  that are the misiecs numbers.

The complex number that are equal to its inverse are the Massena's numbers , and they are closely related to the Riemann zeta function just like they were married to each other.

$$\frac{1}{n*n^{(1+n*n*i)}} = \frac{a+xi}{a-xi} * \frac{a+xi}{a+xi} = \frac{a^2+2xi-x}{a^2+x} \rightarrow a^2 + 2xi - x = a^2 + x \rightarrow x = \frac{x}{i} \Rightarrow$$

$$x = \frac{x}{i} = \frac{x}{\sqrt{-1}} * \frac{\sqrt{-1}}{\sqrt{-1}} = \frac{xi}{1} = xi \therefore x^2 = \frac{x}{i} * xi = x^2 = x^2 \rightarrow x = \pm 1 \text{ making } x =$$

y for the purpose of graphic analysis it gives a linear graph if obeyed the rule.

$$\frac{1}{n^{2(s)}} = n^{2s} \text{ (given hypothesis and result in yellow)}$$

$$\text{So } x * \frac{1}{x} - (x - x) = 0 \Rightarrow 1 - x + x = 0 \rightarrow 0 = -1 \therefore \frac{1}{x} * x - (x - x) =$$

$$-1 \Rightarrow \frac{a+xi}{a-xi} = x * \frac{1}{x} - (x - x) \Rightarrow -1 = \frac{a+xi}{a-xi} - (a + x1 - (a - xi)) =$$

$$-1 = -1 - 2xi \Rightarrow 0 = -2xi * \frac{1}{2} \Rightarrow -1 * \frac{1}{2} = -2xi * \frac{1}{2} \Rightarrow -\frac{1}{2} = -xi \\ \Rightarrow xi = \frac{1}{2}$$

$$\text{Stablishing } a + xi = -(a - xi) \Rightarrow a + xi = -a + +xi \Rightarrow 2a = 0; 0 =$$

$$-1; a = \frac{0}{2} \Rightarrow a = -\frac{1}{2} \Rightarrow \frac{-\frac{1}{2}+xi}{-\frac{1}{2}-xi} = -1 \Rightarrow -\frac{1}{2} + xi = \frac{1}{2} + xi \rightarrow -\frac{1}{2} -$$

$$\frac{1}{2} = 0 * (-1) \Rightarrow -1 = 0 \text{ or } 1 = 0; \frac{-(a+xi)}{a-xi} = 1 \rightarrow -a - xi = a - xi = \\ > -a = a$$

$$x = \frac{1}{x} \rightarrow x \rightarrow x - \frac{1}{x} = 0 \rightarrow x * x - \left(x * \frac{1}{x}\right) = \frac{x * x - \left(x * \frac{1}{x}\right)}{2} = 0$$

→ if it is true for infinit numbers  $x$  for the real part of a conjugate pair with real part  $\in \mathbb{Z}$  then there is a solution for infinit numbers of a real part  $x = a + xi$  ou  $a - xi$

$$\rightarrow \left( \frac{a + xi - \left(\frac{1}{(a + xi)}\right) - (a + xi - (a - xi))}{2} \right) = 0 \text{ when } a = 1/2$$

$$\frac{1}{2} \left( \left( a + \xi - \left( \frac{1}{a} + \xi \right) \right) - (a + \xi - (a - \xi)) \right) = 0$$

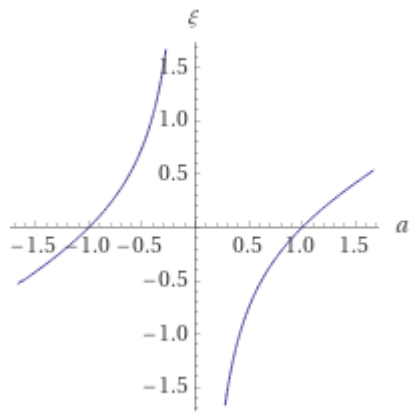
**Result:**

$$\frac{1}{2} \left( a - \frac{1}{a} - 2\xi \right) = 0$$

**Geometric figure:**

- Properties  
hyperbola

**Implicit plot:**



**Alternate form assuming  $a$  and  $\xi$  are real:**

$$a = \frac{1}{a} + 2\xi$$

**Alternate forms:**

$$a\xi = \frac{a^2}{2} - \frac{1}{2}$$

$$\frac{a^2 - 2a\xi - 1}{2a} = 0$$

- Enlarge
- Customize
- Plain Text

**Alternate form assuming  $a$  and  $\xi$  are positive:**

$$a^2 = 2a\xi + 1$$

**Expanded form:**

- Step-by-step solution

$$\frac{a}{2} - \frac{1}{2a} - \xi = 0$$

**Solution:**

$$a \neq 0, \quad \xi = \frac{a^2 - 1}{2a}$$

**Integer solution:**

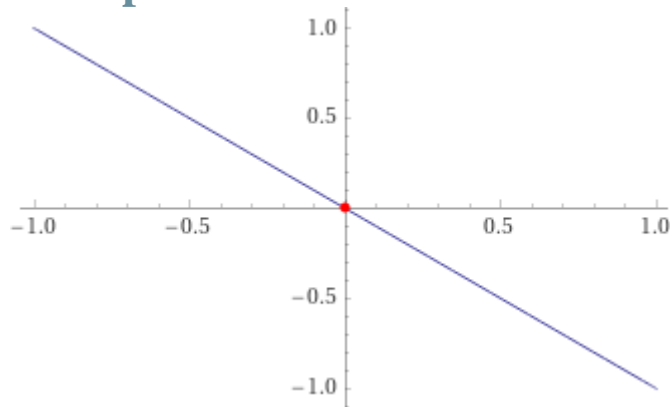
$$a = \pm 1, \quad \xi = 0$$

$$\frac{1}{2} \left( \left( \frac{1}{2} + \xi - \left( \frac{1}{2} + \xi \right) \right) - \left( \frac{1}{2} + \xi - \left( \frac{1}{2} - \xi \right) \right) \right) = 0$$

**Result:**

$$-\xi = 0$$

**Root plot:**



- Enlarge
- Customize

**Number line:**



**Solution:**

- Step-by-step solution
- $$\xi = 0$$

The linear graph is compatible at zero is compatible with a linear solution for infinit numbers with  $\frac{1}{2}$  as the real part, not allowing for secondary non trivial zeros outside of the line of the graph, thus proving that there are no other zeros outside the critical line.

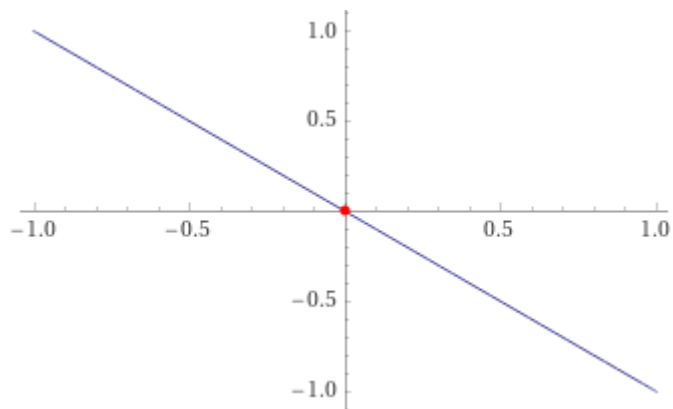
If it is continued to be obtained the value of half for the real part of other number than  $\frac{1}{2}$  as  $\frac{1}{4}$  it continues to keep the linear relation wich vanishes as the proportion is kept to the same proportion of the real part  $\frac{1}{4}, \frac{3}{4}, \text{etc...}$

$$\frac{1}{2} \left( \left( \frac{1}{4} + \xi - \left( \frac{1}{4} + \xi \right) \right) - \left( \frac{1}{4} + \xi - \left( \frac{1}{4} - \xi \right) \right) \right) = 0$$

**Result:**

$$-\xi = 0$$

**Root plot:**



- Enlarge
- Customize

**Number line:**



**Solution:**

- Step-by-step solution

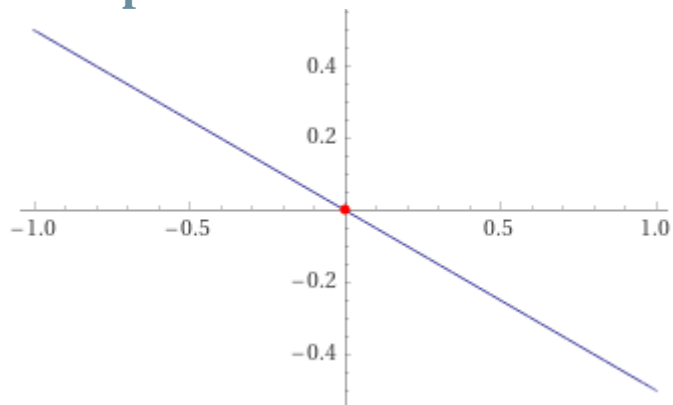
$$\xi = 0$$

$$\frac{1}{4} \left( \left( \frac{1}{4} + \xi - \left( \frac{1}{4} + \xi \right) \right) - \left( \frac{1}{4} + \xi - \left( \frac{1}{4} - \xi \right) \right) \right) = 0$$

**Result:**

$$-\frac{\xi}{2} = 0$$

**Root plot:**



- Enlarge
- Customize

**Number line:**



**Solution:**

- Step-by-step solution

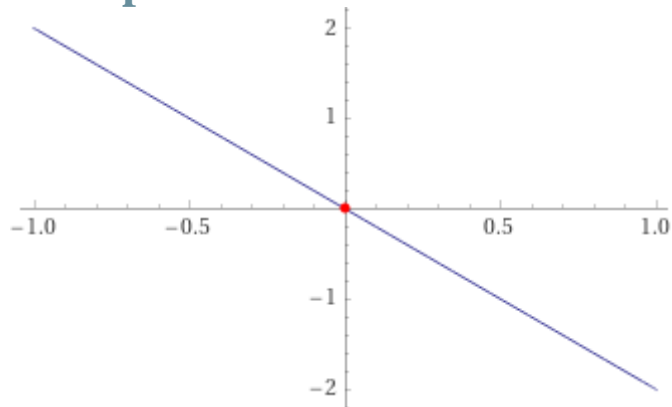
$$\xi = 0$$

$$\left(\frac{3}{4} + \xi - \left(\frac{3}{4} + \xi\right)\right) - \left(\frac{3}{4} + \xi - \left(\frac{3}{4} - \xi\right)\right) = 0$$

**Result:**

$$-2\xi = 0$$

**Root plot:**



- Enlarge
- Customize

**Number line:**



**Solution:**

- Step-by-step solution

$$\xi = 0$$

[Download Page](#)

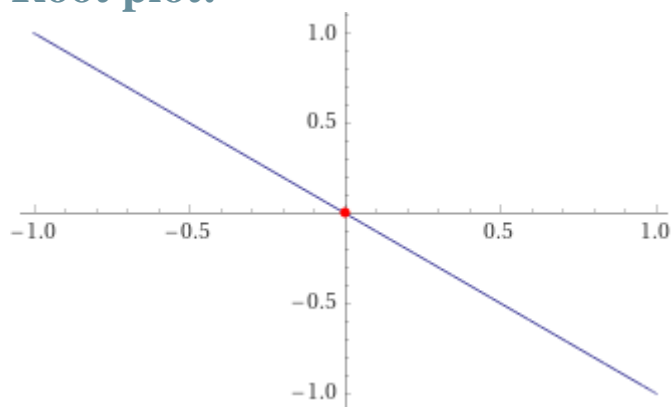
POWERED BY THE WOLFRAM LANGUAGE

$$\frac{1}{2} \left( \left( \frac{3}{4} + \xi - \left( \frac{3}{4} + \xi \right) \right) - \left( \frac{3}{4} + \xi - \left( \frac{3}{4} - \xi \right) \right) \right) = 0$$

**Result:**

$$-\xi = 0$$

**Root plot:**



- Enlarge
- Customize

## Number line:



## Solution:

- Step-by-step solution

$$\xi = 0$$

[Download Page](#)

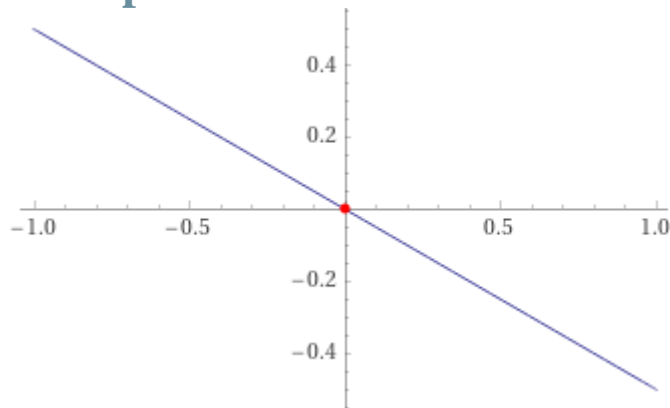
POWERED BY THE WOLFRAM LANGUAGE

$$\frac{1}{4} \left( \left( \frac{3}{4} + \xi - \left( \frac{3}{4} + \xi \right) \right) - \left( \frac{3}{4} + \xi - \left( \frac{3}{4} - \xi \right) \right) \right) = 0$$

## Result:

$$-\frac{\xi}{2} = 0$$

## Root plot:



- Enlarge
- Customize

## Number line:



## Solution:

- Step-by-step solution

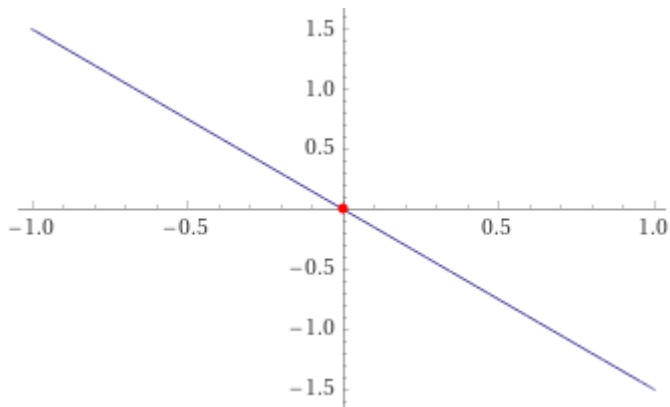
$$\xi = 0$$

$$\left( \left( \frac{3}{4} + \xi - \left( \frac{3}{4} + \xi \right) \right) - \left( \frac{3}{4} + \xi - \left( \frac{3}{4} - \xi \right) \right) \right) \times \frac{3}{4} = 0$$

## Result:

$$-\frac{3\xi}{2} = 0$$

## Root plot:



- Enlarge
- Customize

## Number line:



## Solution:

- Step-by-step solution

$$\xi = 0$$

[Download Page](#)

POWERED BY THE [WOLFRAM LANGUAGE](#)

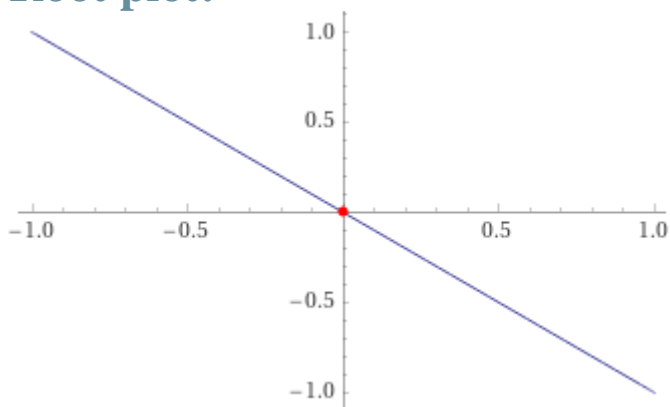
That is not expected for a whole number belonging to  $\mathbb{Z}$  thus not respecting the logic of the statement that says that if there is a number that has the same value of its inverse, then the difference between that number and its inverse must be zero, so avoiding the possibility for other numbers different from  $\frac{1}{2}$  be considered in the proof.

$$\frac{1}{2} ((1 + \xi - (1 + \xi)) - (1 + \xi - (1 - \xi))) = 0$$

## Result:

$$-\xi = 0$$

## Root plot:



- Enlarge
- Customize



## Number line:



## Solution:

- Step-by-step solution

$$\xi = 0$$

[Download Page](#)

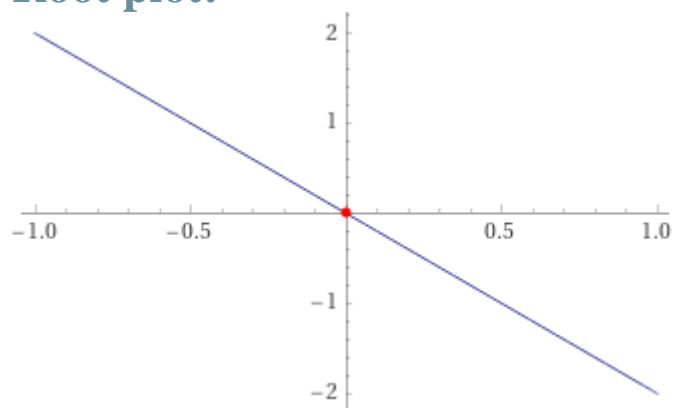
POWERED BY THE [WOLFRAM LANGUAGE](#)

$$\frac{(1 + \xi - (1 + \xi)) - (1 + \xi - (1 - \xi))}{1} = 0$$

## Result:

$$-2\xi = 0$$

## Root plot:



- Enlarge
- Customize

## Number line:



## Solution:

- Step-by-step solution

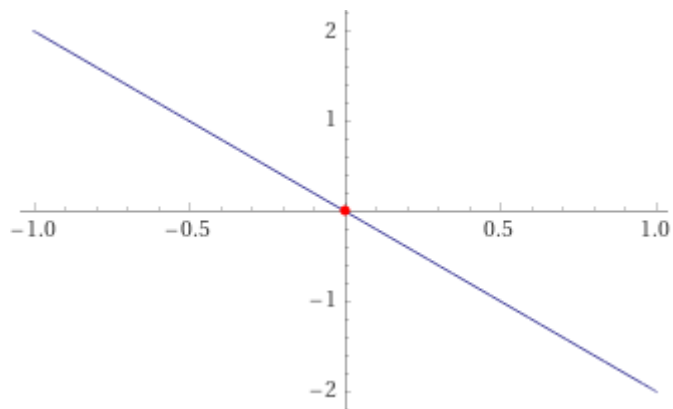
$$\xi = 0$$

$$\frac{(0 + \xi - (0 + \xi)) - (0 + \xi - (0 - \xi))}{1} = 0$$

## Result:

$$-2\xi = 0$$

## Root plot:



- Enlarge
- Customize

**Number line:**



**Solution:**

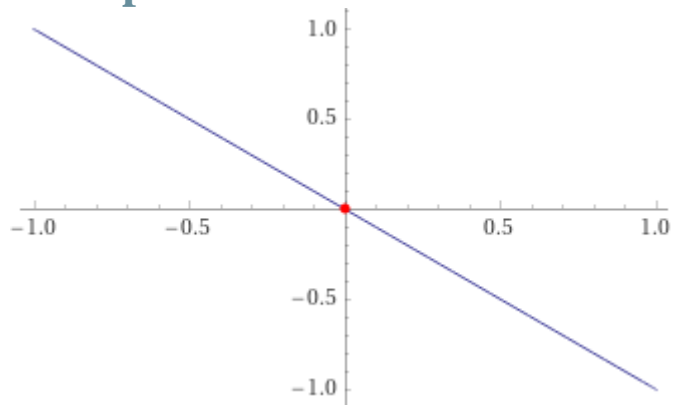
- Step-by-step solution
- $\xi = 0$

$$\frac{1}{2} ((0 + \xi - (0 + \xi)) - (0 + \xi - (0 - \xi))) = 0$$

**Result:**

$$-\xi = 0$$

**Root plot:**



- Enlarge
- Customize

**Number line:**



**Solution:**

- Step-by-step solution
- $\xi = 0$

So analysing the graphs it becomes clear that the necessary linear relation of “green”, to be true it must be multiplied by the value of  $\frac{1}{2}$  that can be attributed for “a” in  $a+xi$ , as the value of theta, of the zeta function, other wise the infinit linear relation for the non trivial zeros to lay over the critical line  $\frac{1}{2}$  is contradicted.

$$\zeta = \theta + xi * (xi); xi = \frac{1}{2}$$

$$\begin{aligned} \zeta * xi &= \theta xi + xi^2 \Rightarrow \frac{1}{2\zeta} - \frac{\theta 1}{2} + \frac{1}{4} \Rightarrow 4\left(\frac{\zeta}{2} - \frac{\theta}{2}\right) = 1 \Rightarrow 2\zeta - 2\theta = 1 \Rightarrow \zeta - \theta = \frac{1}{2} \\ &> \zeta - \frac{1}{2} = \frac{1}{2} \end{aligned}$$

$\zeta = \frac{1}{2} + \frac{1}{2} = 1$  satisfying the need for the assumption that a number is equal its inverse and that the value of theta in the zeta function be equal  $\frac{1}{2}$ .

Now it remains to prove that there is a relationship between the multiplication  $\rightarrow$

$\left(\frac{a+xi - \left(\frac{1}{(a+xi)}\right) - (a+xi - (a-xi))}{1}\right) * \theta$  that manages the zeta (s) function to then relate to the value of s in  $\sum_1^\infty \frac{1}{n^s}$  and then tell me if there is an infinite relationship, which can be done by replacing xi with x / i which are identical.

$$s = \theta + \frac{x}{i} \Rightarrow is = \theta i + x * (\theta) \Rightarrow i\theta s = \theta^2 i + \theta x \rightarrow \theta = \frac{1}{2} \Rightarrow \frac{is}{2} = \frac{i}{4} + \frac{x}{2}$$

$$2is = i + 2x \Rightarrow 2is - i = 2x \Rightarrow s = \frac{i + 2x}{2i} \Rightarrow s = \frac{i}{2i} + \frac{2x}{2i} = \frac{1}{2} + \frac{x}{i} \therefore s = \frac{1}{2} + xi$$

$$i\theta s = \theta^2 i + \theta x * (\theta); \theta = \frac{1}{4} \Rightarrow i\frac{1}{4}s = \frac{1i}{16} + \frac{1x}{4} \Rightarrow 4is = i + 4x \Rightarrow s = \frac{i+4x}{4i} \Rightarrow s = \frac{i}{4i} + \frac{4x}{4i} = s = \frac{1}{4} + \frac{x}{i} \Rightarrow s = \frac{1}{4} + xi$$

so it is shown that the multiplication by theta with different values shown in graphs above is equivalent as changing the values of theta for the zeta function here considered to be s. So it is possible to consider the analysis of the linearity of the graphs for different values of theta, and conclude that the linearity required for the deduction through the logical steps proposed before to be truly linear must have theta of value equals  $\frac{1}{2}$ , that makes the function of the misiec's zeta numbers  $\frac{1}{n * n^{\frac{1}{2} + n * i}} = \frac{1}{n^s}$ .

Thus given the fact that the last form

$\frac{1}{n^s}$  gives a divergent to infinity result, it is proven that they all lay over the critical line