

Numbers that are equal to its inverse other than ± 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.

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

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

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

$$\begin{aligned} -1 &= -1 - 2xi \Rightarrow 0 = -2xi * \frac{1}{2} \Rightarrow -1 * \frac{1}{2} = -2xi * \frac{1}{2} \Rightarrow -\frac{1}{2} = -xi \\ &\Rightarrow xi = \frac{1}{2} \end{aligned}$$

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

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

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

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

→ 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 $a - xi$

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

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

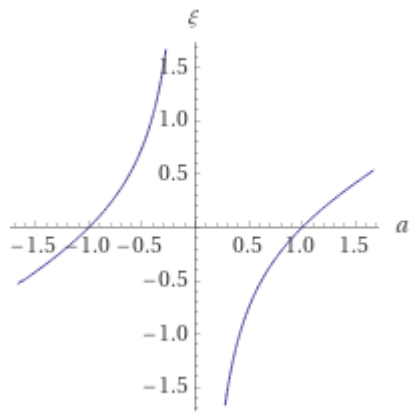
Result:

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

Geometric figure:

- Properties
hyperbola

Implicit plot:



Alternate form assuming a and ξ are real:

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

Alternate forms:

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

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

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Alternate form assuming a and ξ 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:

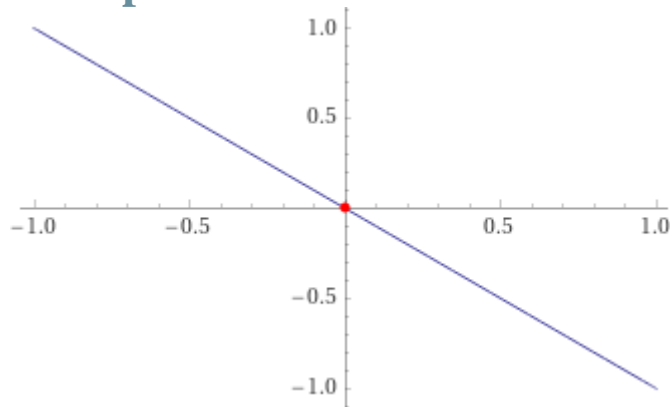
$$a = \pm 1, \quad \xi = 0$$

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

Result:

$$-\xi = 0$$

Root plot:



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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.

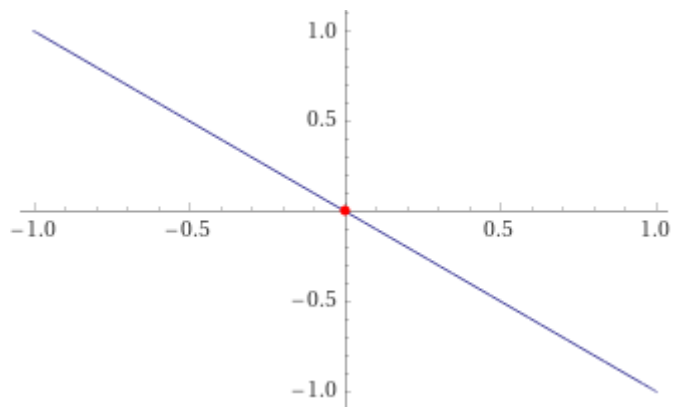
If it is continued to be obtained the value of half for the real part of other number than $\frac{1}{2}$ as $\frac{1}{4}$ it continues to keep the linear relation wich vanishes as the proportion is kept to the same proportion of the real part $\frac{1}{4}, \frac{3}{4}, \text{etc...}$

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

Result:

$$-\xi = 0$$

Root plot:



- Enlarge
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Number line:



Solution:

- Step-by-step solution

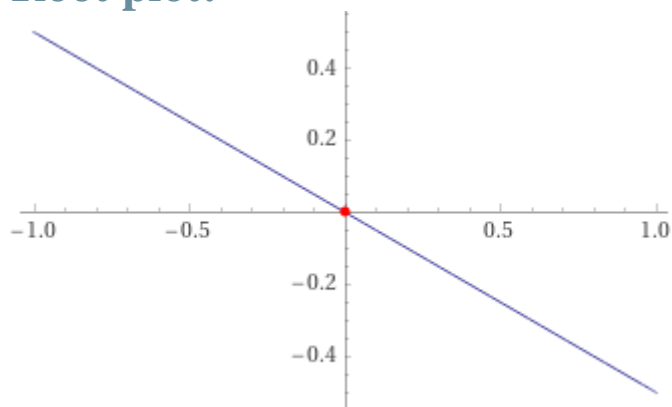
$$\xi = 0$$

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

Result:

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

Root plot:



- Enlarge
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Number line:



Solution:

- Step-by-step solution

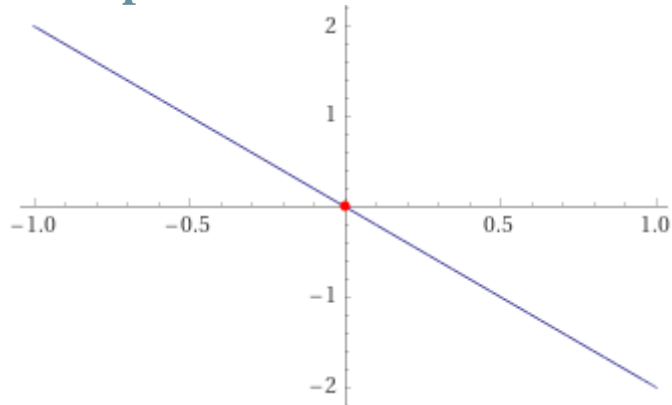
$$\xi = 0$$

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

Result:

$$-2\xi = 0$$

Root plot:



- Enlarge
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Number line:



Solution:

- Step-by-step solution

$$\xi = 0$$

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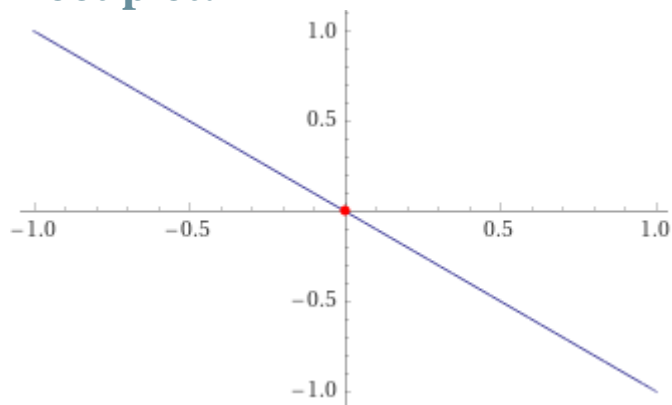
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$$\frac{1}{2} \left(\left(\frac{3}{4} + \xi - \left(\frac{3}{4} + \xi \right) \right) - \left(\frac{3}{4} + \xi - \left(\frac{3}{4} - \xi \right) \right) \right) = 0$$

Result:

$$-\xi = 0$$

Root plot:



- Enlarge
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Number line:



Solution:

- Step-by-step solution

$$\xi = 0$$

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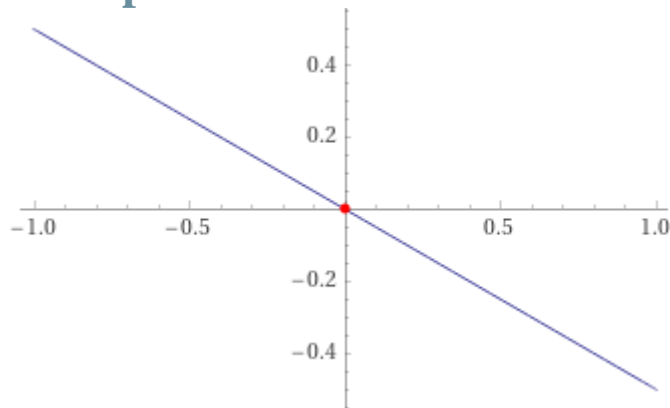
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$$\frac{1}{4} \left(\left(\frac{3}{4} + \xi - \left(\frac{3}{4} + \xi \right) \right) - \left(\frac{3}{4} + \xi - \left(\frac{3}{4} - \xi \right) \right) \right) = 0$$

Result:

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

Root plot:



- Enlarge
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Number line:



Solution:

- Step-by-step solution

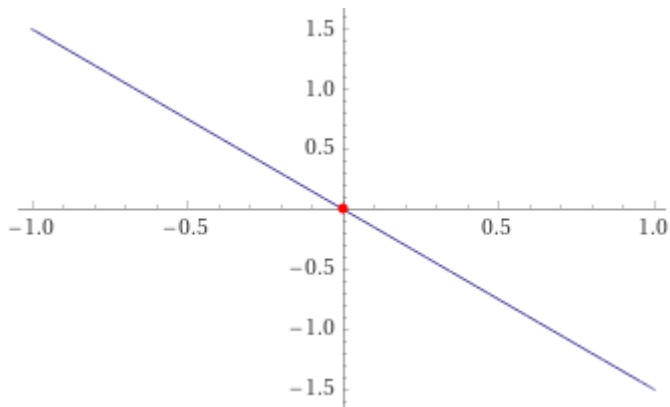
$$\xi = 0$$

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

Result:

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

Root plot:



- Enlarge
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Number line:



Solution:

- Step-by-step solution

$$\xi = 0$$

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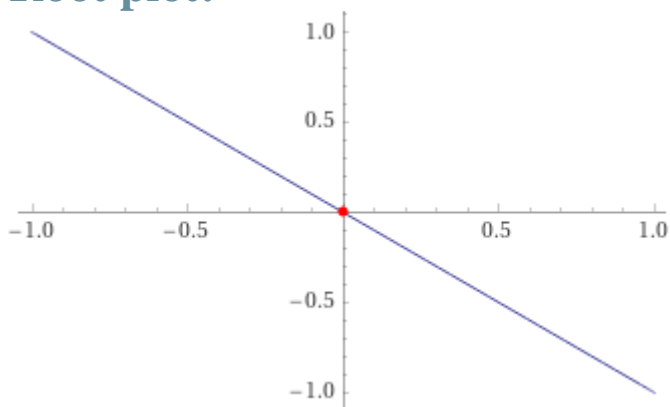
That is not expected for a whole number belonging to \mathbb{Z} thus not respecting the logic of the statement that says that if there is a number that has the same value of its inverse, then the difference between that number and its inverse must be zero, so avoiding the possibility for other numbers 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
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Number line:



Solution:

- Step-by-step solution

$$\xi = 0$$

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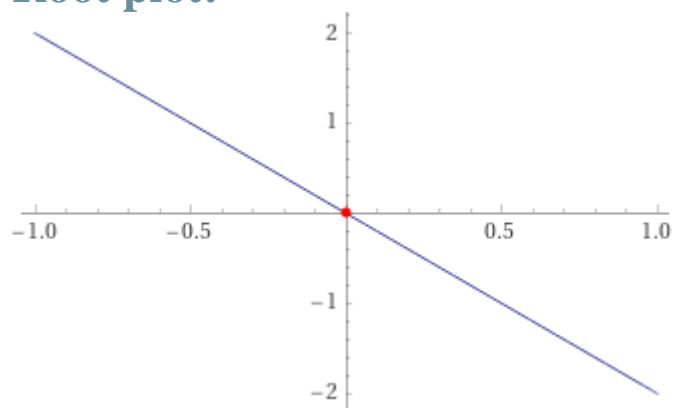
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$$\frac{(1 + \xi - (1 + \xi)) - (1 + \xi - (1 - \xi))}{1} = 0$$

Result:

$$-2\xi = 0$$

Root plot:



- Enlarge
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Number line:



Solution:

- Step-by-step solution

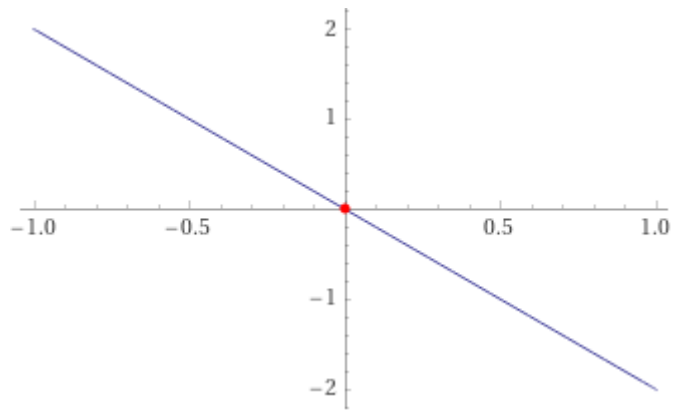
$$\xi = 0$$

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

Result:

$$-2\xi = 0$$

Root plot:



- Enlarge
- Customize

Number line:



Solution:

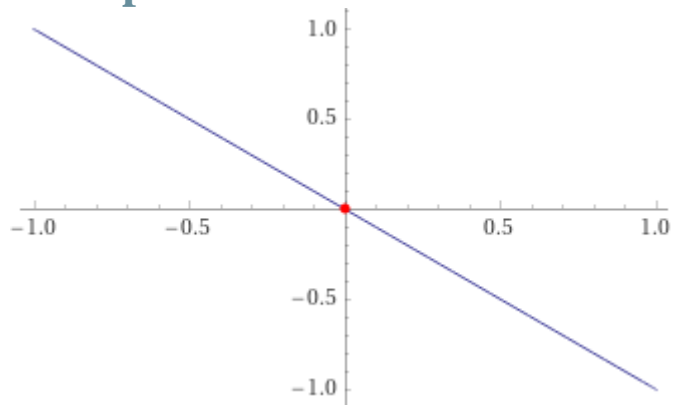
- Step-by-step solution
- $\xi = 0$

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

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.

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

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

$\zeta = \frac{1}{2} + \frac{1}{2} = 1$ 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 $\frac{1}{2}$