Solution for Equation $X^2 + 1 = 0$

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Abstract

In this paper we used an equality relation from complex plane to find the solution for the know quadratic equation $X^2 + 1 = 0$

Keywords: zeta function, Riemann hypothesis, complex plane, none-trivial zeros, critical strip

1. Introduction

1- For any Natural numebr [A]

$$\frac{1}{i+A} = \frac{A}{A^2+1} - \frac{i}{A^2+1} \rightarrow (1)$$

$$\frac{1}{i-A} = \frac{A}{A^2+1} + \frac{i}{A^2+1} \rightarrow (2)$$

$$\frac{A^2+1}{i+A} = A - i$$

2- Rearrange equation (1) and (2)

$$A^2 + 1 = (A-i)(A+i) \rightarrow (3)$$

$$A^2 - i^2 = (A-i)(A+i) \rightarrow (4)$$

We will use $Rf(A) = (A-i)(A+i) = 0$ to get the Zeros and solution for $X^2 + 1 = 0$ based on the Equality equation (4).

$$Lf(A) = A^2 + 1 = 0$$

$$Rf(A) = (A-i)(A+i) = 0$$

3- Another form for the equality relation

For positive Zeros

$$A^2 + 1 = A^2 - i^2 = (1 - Ai)(1 + A\,i) \rightarrow (5)$$

For negative Zeros

$$-1 * (A^2 + 1) = (-1 + Ai)(1 + A\,i) \rightarrow (6)$$

$$-1 * A^2 + 1 = -1 * ((A-i)(A+i) - 2) \rightarrow (7)$$

Table 1. Positive Zeros for the equality relation

A	A^2+1	$(A-i)(A+i)$	$(1-Ai)(1+Ai)$
1	2	2	2
2	5	5	5
3	10	10	10
4	17	17	17
5	26	26	26
6	37	37	37
7	50	50	50
8	65	65	65
9	82	82	82
10	101	101	101
11	122	122	122
12	145	145	145
13	170	170	170

Table 2. Negative Zeros for the equality relation

A	(- A^2+1)	$(A-i)(A+i)$	$-1*((A-i)(A+i)-2)$
1	0	2	0
2	-3	5	-3
3	-8	10	-8
4	-15	17	-15
5	-24	26	-24
6	-35	37	-35

7	-48	50	-48
8	-63	65	-63
9	-80	82	-80
10	-99	101	-99
11	-120	122	-120
12	-143	145	-143
13	-168	170	-168

4- First visualize these two functions in a complex plane

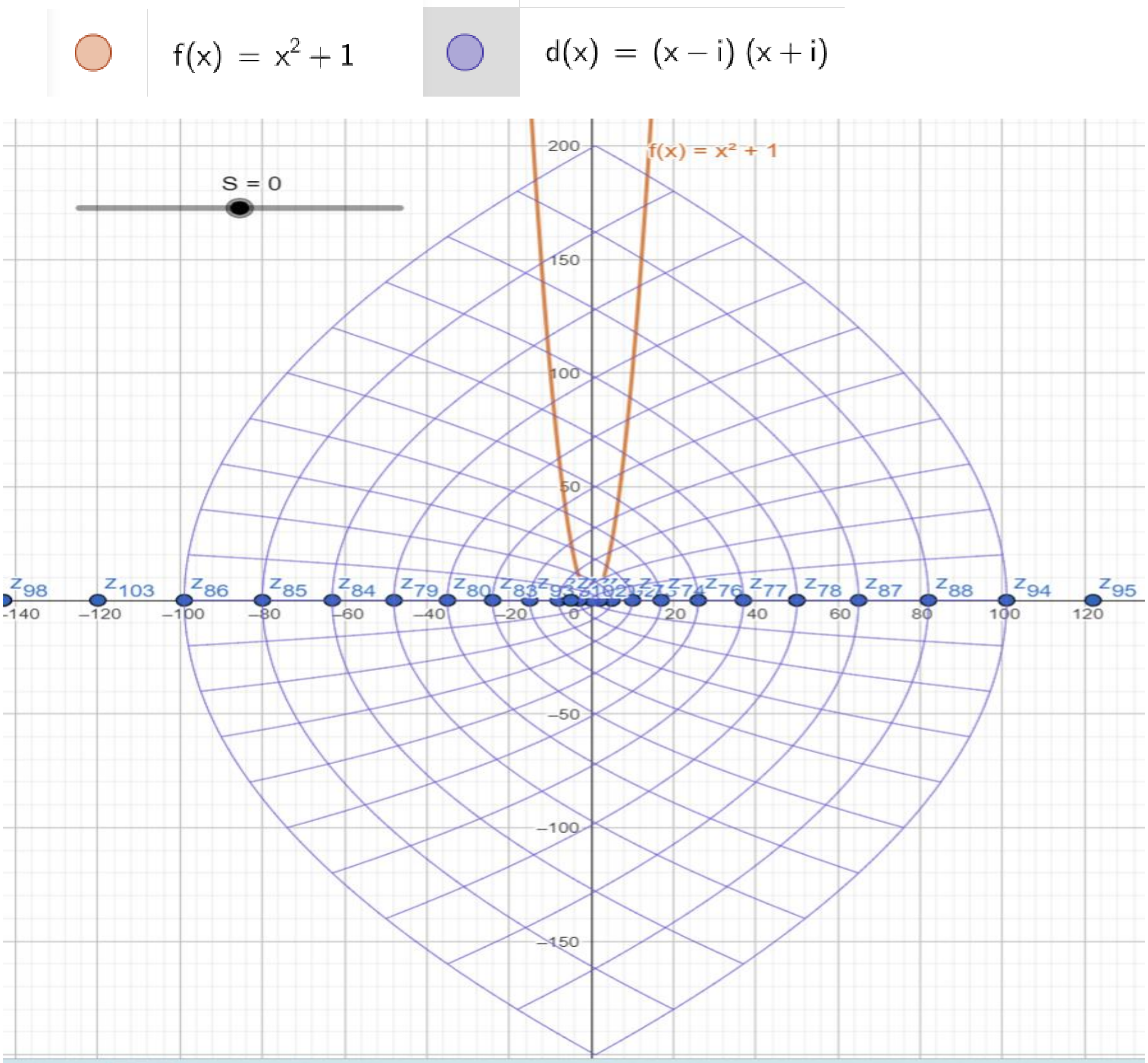

Figure 1. Shows the visualization for both function $A^2 + 1$ and for function $(A - i)(\,A + i)$

5- Positive Zeros for $(A - i)(\,A + i)$
all points that are zeros for $A^2 + 1$ are the points that equation $(A - i)(\,A + i)$ contour lines intersects with x axis in complex plane

$A^2 + 1 = (A - i)(\,A + i)$ ➔(3)

For examples for positive Zeros Table 1. have examples for some zeros for some values of A for positive Zeros.

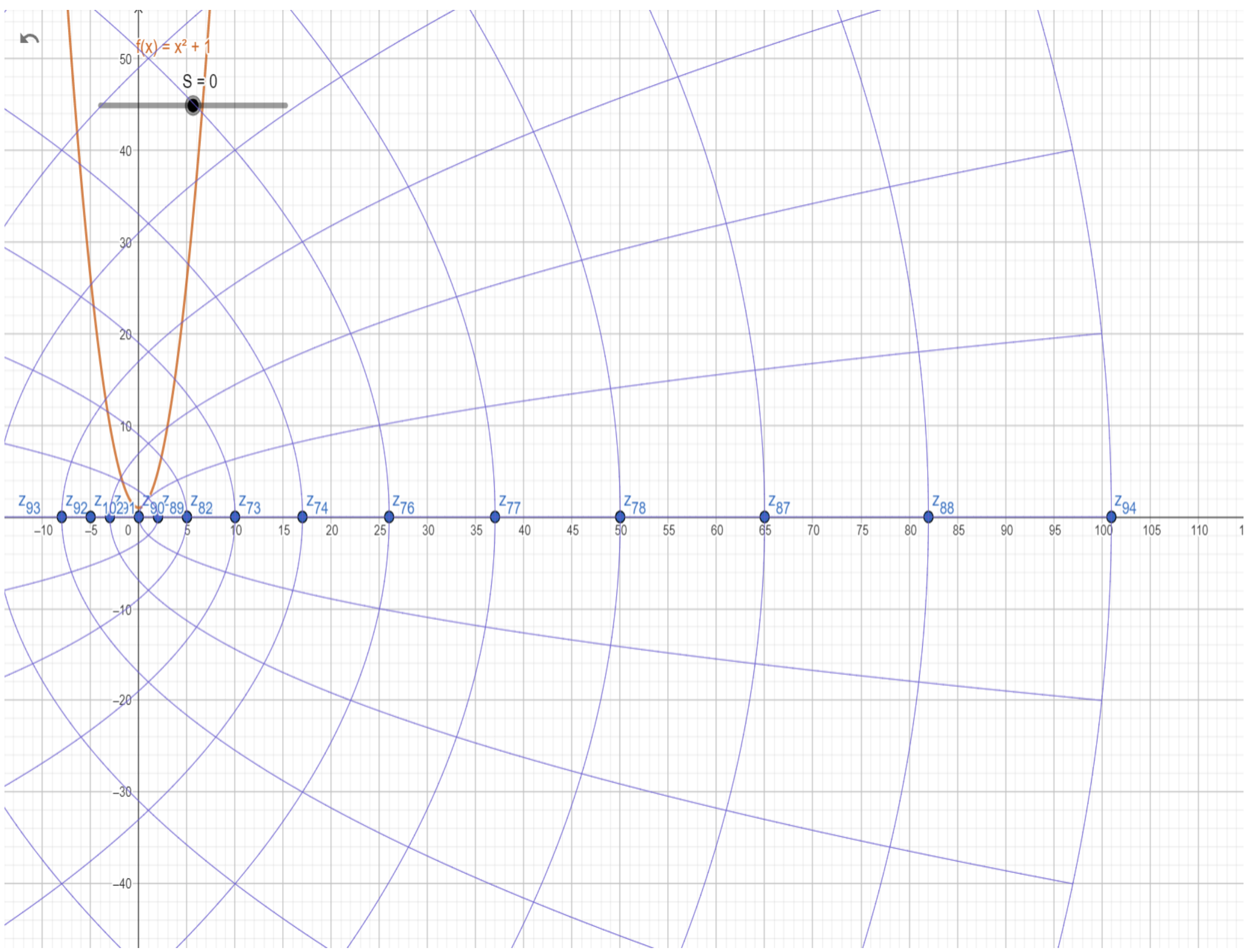

Figure 2. Positive Zeros for function $(A - i)(\,A + i)$ at x axis in complex plane.

6- Negative Zeros for $(A-i)(A+i)$

all points that are zeros for A^2+1 are the points that equation $(A-i)(A+i)$ contour lines intersect with x axis in complex plane.

$$-1 * A^2 + 1 = -1 * ((A-i)(A+i) - 2) \rightarrow (7)$$

For examples for positive Zeros Table 2. have examples for some zeros for some values of A for Negative Zeros.

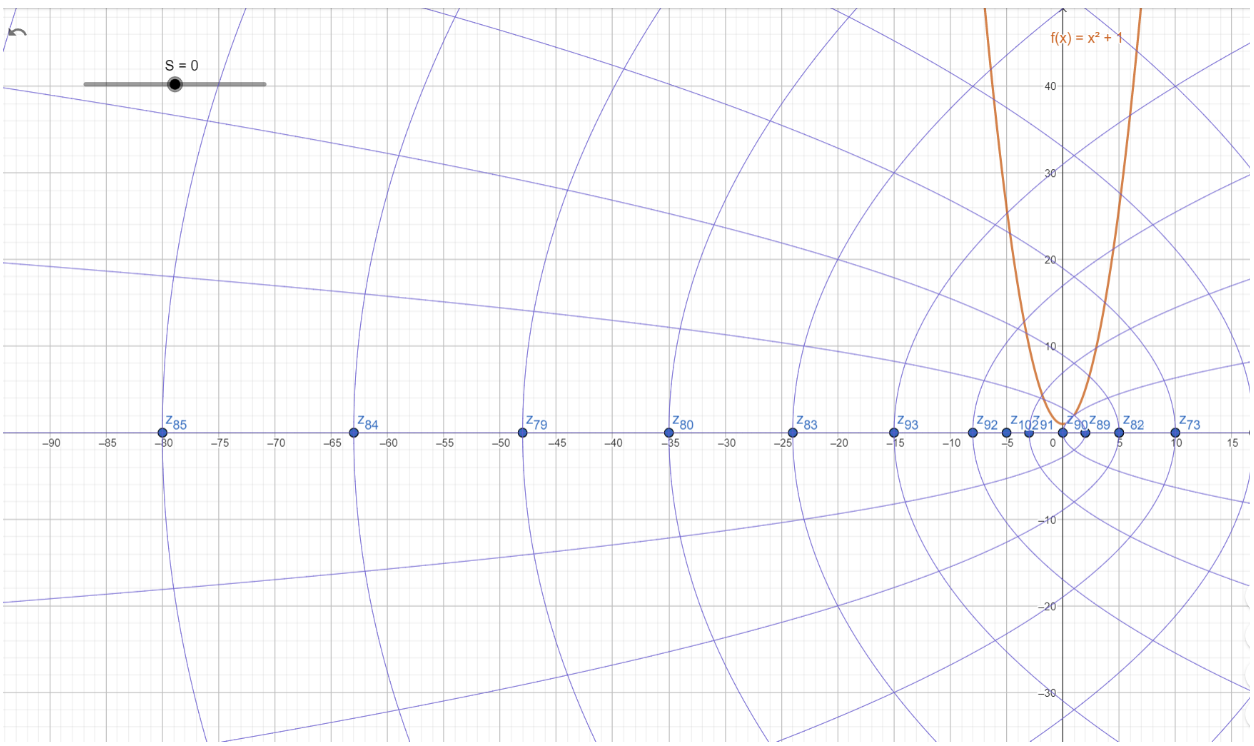

Figure 3. Negative Zeros for function $(A-i)(A+i)$ at x axis in complex plane.

Conclusion

In this paper we used an equality relation from complex plane to find the solution for the know quadratic equation $X^2+1=0$

$$\frac{1}{i+A} = \frac{A}{A^2+1} - \frac{i}{A^2+1} \rightarrow (1)$$

$$A^2 - i^2 = (A-i)(A+i) \rightarrow (4)$$

By finding the Zeros for function $(A-i)(A+i)$ we can find the Zeros for $X^2+1=0$

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