Narrow Hyper Imaginary Number and Generalized Hyper Imaginary Number

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Abstract

On the basis of the traditional imaginary number, the author puts forward the concept of narrow hyper imaginary number and generalized hyper imaginary number. It gives a new terse form like traditional imaginary number. Although it is just the advance of the concept, its meaning is very significant. Its characteristics need further study. Especially the problem of infinite is also discussed. Because of the complexity of infinite, it still is a difficulty in the domain of mathematics. In this paper, the author only gives elementary thinking about infinite. Infinite may be regarded as a set and every element in this set has a limit tending to infinity. The concept of natural infinite also be put forward on basis of it. Of course it is just a elementary idea and needs futher study.

Keywords: imaginary number, narrow hyper imaginary number, generalized hyper imaginary number, hyper imaginary number, complex sets, hyper complex sets, Abel, Galois, the theory of group, the set of infinite, nature infinite.

1. Preface

Once for a period of time, many mathematicians have a strong interest on the solution of high-order algebraic equations. They have completely solved the solution of three-order and four-order algebraic equations. Before long, the famous mathematician Abel prove that the five-order and above five-order algebraic equations have not a formula solution. They often ignore some complex number solutions of the algebraic equations when they solve three-order algebraic and four-order algebraic equations. They think that the square root of negative is insignificant. It keeps the integrity of solutions of algebraic equations until the imaginary number i is put forward. The author gives a terse form about some number like $\sqrt[\pi]{-1}$ 、 $\sqrt[e]{-1}$ etc on basis of it. The famous mathematician and master Euler thinks that the value of $(-1)^{\infty}$ may be $(+1)$ or (-1) or haven't a certain or significant value in his bookmaking extended theory of infinite analysis.

For example:

for $(-1)^{2k+v_1}$, when $k\to\infty$, $(-1)^{2k+v_1}\to(-1)^{\infty}$ and $(-1)^{2k+v_1}\to(-1)^{v_1}$.

for $(-1)^{2k+v_2}$, when $k\to\infty$, $(-1)^{2k+v_2}\to(-1)^{\infty}$ and $(-1)^{2k+v_2}\to(-1)^{v_2}$.

And so on ……

These lead to a contradiction that $(-1)^{\infty}$ may be equal to $(-1)^{v_1}, (-1)^{v_2}$ etc. Here v_1 and v_2 are different numbers respectively. But with the development of mathematics, these problems will get a nice solution.

2. Narrow hyper imaginary number

In order to make some number like $\sqrt[\pi]{-1}$ and $\sqrt[e]{-1}$ etc significant, here gives the concept of narrow hyper imaginary number.

Definition(1): for irrational number u, define $j_u = \sqrt[u]{-1}$ as narrow hyper imaginary number.

So $\sqrt[\pi]{-1}$ and $\sqrt[e]{-1}$ can be written as j_π and j_e respectively, i.e. $j_\pi = \sqrt[\pi]{-1}$ and $j_e = \sqrt[e]{-1}$.

For two random irrational number u_1 and u_2, we have the conclusion as following:

$$j_{u_1} = \sqrt[u_1]{-1} = (-1)^{u_1} = [(-1)^{u_2}]^{\frac{u_1}{u_2}} = (j_{u_2})^{\frac{u_1}{u_2}}$$

3. Generalized hyper imaginary number

On the basis of narrow hyper imaginary number, here gives the concept of generalized hyper imaginary number.

Definition (2): for real number v, define $j_v = \sqrt[v]{-1}$ as generalized hyper imaginary number, also called hyper imaginary number concisely. Here gives some simple characters of hyper imaginary number. For hyper imaginary number j_v, have

1) when v=0, $j_0 = (-1)^{\infty}$

Here, the value of j_0 is uncertain, mainly because the concept of infinite is obscure, how big on earth infinite is? Which way infinite moves in? and so on. These whys lead to the uncertainty of j_0. Here, the author thinks that infinite is not just regarded as a number, but a set. We may define a set of infinite. In the set, each element is an infinite of diverse levels. There are some difference in their ways and the speed of tending to infinite. In addition, We can define as follows: in the set of infinite, natural number limit is defined as natural number. In the set of infinite, other element can refer to natural number. We can check the way and speed of other elements in the set of infinite. Of course , it needs to discuss and study further.

2) when v =1, $j_1 = (-1)$

Here, j_1 becomes a real number, a random real number can be expressed by j_1.

3)when v=2, $j_2 = \sqrt{-1} = i$

Here, j_2 is equal to imaginary number i. A random complex number is a combination of imaginary number and hyper imaginary number. So it can be seen that hyper imaginary number includes imaginary number, imaginary number is just a special example of hyper imaginary number.

4. Postscript

Furthermore, let A denotes a set including all the hyper imaginary number. The hyper complex number set $f(A)$ is made up of A . traditional complex number set C is just a subset of $f(A)$. Of course the concrete structure of hyper complex number set is complicated and needs to study further. At present, the hyper imaginary number has not the same status as traditional imaginary number i, but the author believes that the hyper imaginary number will have a important role in future, especially the time when science is developing fast. It is a great pity that the theory of group (which is put forward by Galois) is not accepted by people of that era in the history of mathematics. Of course, the hyper imaginary number can not be compared with the theory of group. But pure theory should need to be supported because its utility can not be seen at once. Owing to the author's narrow level, if you have some good ideas about the paper, don't hesitate to disturb me and point out some mistakes. Thanks for your criticism!

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