The Singularity Number 1/0: A New Framework for Mathematics and Physics

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Abstract

We introduce the Singularity Number j, defined as $1/0 = j$, and construct the Singularity set $\mathbb{E}$ ('E'xtended number set). We explore its mathematical structures and apply them across classical mechanics, quantum mechanics, general relativity, thermodynamics, particle physics, and cosmology, offering a unified framework to address singularities in mathematics and physics.

Contents

1 Introduction

Traditional mathematics prohibits division by zero due to contradictions. Introducing j where $1/0 = j$ opens a consistent new system, the Singularity Field $\mathbb{J}$, offering powerful extensions to both mathematics and physics.(j is taken from the author's name seo'j'oon.)

2 The Singularity Number j

2.1 Definition

$$j \overset{\text{def}}{=} \{x \mid 0x = 1\}$$

$$\mathbb{J} = \{x \mid 0x = a, (a \in \mathbb{C} - \{0\})\}$$

$$\mathbb{E} = \mathbb{C} \cup \mathbb{J}$$

2.2 Axioms

About $a, b, c \in \mathbb{E} - \{0\}$,

$$a + b = b + a$$

$$a + b + c = a + (b + c) = (a + b) + c$$

$$a \times b = b \times a$$

$$a \times (b + c) = a \times b + a \times c$$

$$a \times b \times c = (a \times b) \times c = a \times (b \times c)$$

About $a, b, c \in \mathbb{E}$,

$$a + b = b + a$$

$$a + b + c = a + (b + c) = (a + b) + c$$

$$a \times b = b \times a$$

And,

$$0 \times 0 = 0$$

$$j + 0 = j$$

$$j \times 0 = 1$$

$$j \times 1 = j$$

$$j \times j = j$$

$$0 \times (a \times j) = a$$

$$\frac{1}{j} = 0$$

2.3 Theorems

$$p : \text{j is not complex number}$$

p is true. because, Let's assume that p is false. Since j is a complex number, multiplying by 0 should result in 0. However, by definition, 0j=1, which leads to a contradiction.

2.4 Calculations

By axioms, $(a_1 \neq 0, a_2 \neq 0)$

$$(a_1 j) + (a_2 j) = (a_1 + a_2) j$$
$$(a_1 j) \times (a_2 j) = (a_1 a_2) j$$

Additionally,

$$(j + 0)(j + 0) = j$$

By axioms, the distributive property does not hold in $(j + 0)(j + 0)$. and, $j + 0 = j$

$$j \times j = j$$

Now, let's consider the results of inserting j into various functions. First, let's insert a singularity number into a complex coefficient polynomial. First, let's look at a simple function x^2. When $aj + b, (a \neq 0, b \neq 0)$ is substituted into x^2, $j(a^2 + 2ab) + b^2$ is obtained. However, one might think that x^2 is the same as $x^2 + 0x$, but this is not true. This equation is based on the assumption of $x^2 + 0x = x^2$, but since it results in $0x \neq 0$, $x^2 + 0x = x^2$ is not true.

When $aj + b, (a \neq 0, b = 0)$ we can replace $aj + b$ with aj, In a similar way, When $aj + b, (a = 0, b \neq 0)$ we can replace $aj + b$ with $b + 1 = b'$, When $aj + b, (a = 0, b = 0)$ we can replace $aj + b$ with $b' = 1$, so, There are three cases when $x = aj + b$,$x = aj$,$x = b$, In all three cases, the following equation holds. for all $a, b \in \mathbb{C} - \{0\}$,

$$P(aj + b) = j(P(a + b) - P(b)) + P(b)$$

$P(x)$ is a complex coefficient polynomial.

$$P(x) = \sum a_k x^k$$

$$P(aj + b) = \sum a_k (aj + b)^k$$

$$P(aj + b) = \sum_{k=1}^{n} a_k \{ j \{ (\sum_{m=1}^{k} \binom{k}{m} a^m b^{k-m}) - b^k \} + b^k \}$$

Therefore, When $a, b \in \mathbb{C} - \{0\}$,

$$P(aj + b) = j(P(a + b) - P(b)) + P(b)$$

Moreover,$aj + b \neq a(j + \frac{b}{j})$ because $\frac{b}{j}$ is 0, so, By the axiom, the distributive property does not hold.

We have seen how numbers work in complex coefficient polynomials. However, we know that transcendental functions can be represented as infinite-degree complex coefficient polynomials through Taylor series. Therefore, the following holds.

$$\sin(aj) = \sin(a)j$$

$$e^{aj} = (e^a - 1)j + 1$$

$$\sin(aj + b) = (\sin(a + b) - \sin(b))j + \sin(b)$$

$$\sin(aj + b) = \sin(aj)\cos(b) + \cos(aj)\sin(b)$$

$$\sin(aj + b) = \sin(a)\cos(b)j + (\cos(a) - 1)\sin(b)j + \sin(b)$$

Meanwhile,

$$\sin(aj + b) = \{\sin(a + b) - \sin(b)\}j + \sin(b)$$

Therefore,

$$\sin(aj+b) = \{\sin(a+b)-\sin(b)\}j+\sin(b) = \{\sin(a)\cos(b)+\cos(a)\sin(b)-\sin(b)\}j+\sin(b)$$

In the above equation, we can see that the addition formulas of trigonometric functions work without contradiction within the range of singularity numbers. This suggests that in geometry, length, area, and angles can be extended to the range of singularity numbers and complex numbers.

Conclusion: Interpretative Potential in Theoretical Physics

In this study, we proposed a singular number system based on an alternative axiomatic structure that permits division by zero in a rigorously symbolic way. Through the introduction of a novel entity, denoted by j, we constructed an extended algebraic and analytic framework that departs from classical arithmetic while preserving internal consistency.

Beyond its algebraic originality, this system opens promising possibilities for reinterpretation and modeling of key challenges in contemporary theoretical physics.

Notably, the following areas appear especially compatible with the singular number framework:

- The resolution of black hole singularities via symbolic substitution rather than divergent quantities,
- The reinterpretation of Hawking radiation as an algebraic information restoration process,
- A symbolic encoding of compressed or latent quantum information in singular states,

- The formulation of non-classical derivatives and integrals adapted to singular structures,
- A new approach to the entropy and thermodynamics of extreme gravitational systems,
- The modeling of non-reversible physical processes through inherently non-invertible operators,
- The extension of spacetime metrics to include singular axes beyond conventional geometry.

These connections suggest that the singular number system may provide not only mathematical elegance, but also theoretical relevance in the search for new paradigms in fundamental physics. Further development of this framework may offer a symbolic bridge between algebraic abstraction and physical interpretation at the limits of spacetime and information.