1/0 = 0/0 = refuted!

Ilija Barukčić[1]

[1] Internist, Horandstrasse, DE-26441 Jever, Germany

Correspondence: Ilija Barukčić, Horandstrasse, DE-26441 Jever, Germany. Tel: 0049-(0)4466-333.

Abstract

Objectives:

The problem of the division of zero by zero appears to be as old as science itself, and may be older. Nonetheless, the solution of this to long lasting and not ending issue in mathematics and physics is coming nearer. In point of fact, an end of discussions on the issue of the division of zero by zero is not in sight as long as the solutions of this problem proposed or published are grounded on logical contradictions. Roughly, any contradiction in a formal axiomatic system become disastrous because any theorem can be proven as true (Principle of explosion).

Methods:

A systematic mathematical proof is provided to re-analyze the logical foundations of Saitho's approach to the problem of the division of zero by zero. A direct proof (Inversion) was used to show the truth or falsehood of Saitho's published statement with respect to the division of zero by zero.

Results:

Noncontradiction implies that it cannot be both true, +1=+1 and +1=+0. There is convincing evidence that Saitho's solution of the problem of zero divided by zero is logically inconsistent.

Conclusion: Saitho's equality (1/0)=(0/0) is self-contradictory and refuted.

Keywords: Indeterminate forms, Classical logic, Zero divided by zero

1. Introduction

Needless to say, we all may have false beliefs and can make some mistakes. Roughly, errors in human reasoning may involve bad arguments, incorrect starting points of proofs, incorrect explanations or definitions and other erroneous products of human reasoning. The list of fallacious arguments and methods is very long and contains more than 200 known common fallacies. The first known systematic study of fallacies is ascribed to *Aristotle's De Sophisticis* Elenchis (Sophistical Refutations). Some of the fallacies, which should not be persuasive but they often are, are created unintentionally, while other are created intentionally in order to deceive people. Still, not all scientists seem equally susceptible to fallacies when fallacies make their way into the science. Fallacious arguments generate knowledge of none or of limited value and reduces science into pure believe. In order to take science seriously and to be able to solve real-world challenges it is necessary to identify fallacies as soon as possible thus that the same fallacies cannot make any harm in science. Thus far, charging someone of fallacious reasoning always need to be justified in detail and if possible by a formal scenitific mathematical proof but without lapsing itself into absurdity.

2. Material and Methods

2.1. Definitions

DEFINITION 1. (NUMBER +0)

Let c denote the speed of light in vacuum, let ε_0 denote the electric constant and let μ_0 the magnetic constant, let i denote an imaginary number (Bombelli, 1579). The number +0 is defined as the expression

$$
\begin{aligned}
+0 &\equiv \left(c^2 \times \varepsilon_0 \times \mu_0\right) - \left(c^2 \times \varepsilon_0 \times \mu_0\right) \\
&\equiv +1 - 1 \\
&\equiv +i^2 - i^2
\end{aligned}
\tag{1}
$$

while "=" denotes the equals sign or equality sign (Robert Recorde, 1557) (Rolle, 1690) used to indicate equality and "-" (Widmann, 1489) (Pacioli, 1494) (Robert Recorde, 1557) denotes minus signs used to represent the operations of subtraction and the notions of negative as well and "+" (Widmann, 1489; Pacioli, 1494; Recorde, 1557) denotes the plus signs used to represent the operations of addition and the notions of positive as well.

DEFINITION 2. (NUMBER +1)

Let c denote the speed of light in vacuum, let ε_0 denote the electric constant and let μ_0 the magnetic constant, let i denote an imaginary number (Bombelli, 1579). The number +0 is defined as the expression

$$
+1 \equiv \left(c^2 \times \varepsilon_0 \times \mu_0\right) \equiv -i^2
\tag{2}
$$

DEFINITION 3. (SAITHO'S INCORRECT DEFINITION OF ZERO)

Saburou Saitoh (Saitoh, 2019) defines 0 as

$$
\frac{+1}{+0} \equiv +0
\tag{3}
$$

and equally as

$$
\frac{+0}{+0} \equiv +0
\tag{4}
$$

DEFINITION 4. (SAITHO'S EQUALITY)

It is +0 = +0. Saitoh (Saitoh, 2019) comes to the conclusion based on his definition of zero that

$$
\frac{+1}{+0} \equiv \frac{+0}{+0}
\tag{5}
$$

2.2.1. Axiom I (Lex identitatis. Principium Identitatis. Identity Law)

In general, it is

$$
+1 \equiv +1
\tag{6}
$$

or the superposition of +0 and +1 as one of **the foundations of quantum computing**

$$
+1 \equiv (1+0) \times (1+0) \times (1+0) \times (\dots) \times (1+0)
\tag{7}
$$

2.2. Methods

2.2.1. Direct Proof

Inversion (Toohey, 1948) is an inference rule or a proof method which demands that an immediate inference is made from a certain starting point, axiom or statement. The inverse of the statement P → Q ("If *P is true*, then *Q is true*") is thus far the statement ¬P → ¬Q or in spoken language: "If *P is false*, then *Q is false*". A positively formulated direct proof is based on the assumption that P → Q ("If *P is true*, then *Q is true*") while a negatively formulated direct proof is based on the assumption that ¬P → ¬ Q or "If *P is false*, then *Q is false*".

3. Results

THEOREM 3.1. (REFUTATION OF SAITHO'S EQUALITY 1/0=0/0)

CLAIM.

Saitho's approach to the division by zero is based on the logical contradiction

$$+1 \quad = \quad +0 \tag{8}$$

DIRECT PROOF BY INVERSION.

In general, taking axiom 1 <u>not to be true</u>, it is

$$\mathbf{+1} \quad = \quad \mathbf{+0} \tag{9}$$

which as such is absolutely and obviously erroneous. This is the simplest mathematical form of Aristole's law of contradiction (Barukčić, 2019). Saitho himself has never stated that his approach to the division by zero is grounded on a contradiction. Thus far, it is neither possible nor allowed to deduce Saitho's (Definition 4) equality $(1/0) = (0/0)$ from such an incorrect and fallacious starting point. Multiplying the starting point of this proof by $(1/0)$ we obtain

$$+1 \times \left(\frac{+1}{+0}\right) \quad = \quad +0 \times \left(\frac{+1}{+0}\right) \tag{10}$$

while we leave open the value of $(1/0)$. Rearranging equation, it is

$$+1 \times \left(\frac{+1}{+0}\right) \quad = \quad +1 \times \left(\frac{+0}{+0}\right) \tag{11}$$

We obtain Saitoh's equality without any technical error as

$$\left(\frac{\mathbf{+1}}{\mathbf{+0}}\right) \quad = \quad \left(\frac{\mathbf{+0}}{\mathbf{+0}}\right) \tag{12}$$

QUOD ERAT DEMONSTRANDUM.

4. Discussion

The issue of division by zero as documented in literature appears to be as old as science itself. To date, we are on the edge to solve this and other fundamental problems of science and especially of mathematics itself. Still, the trials to approach to the solution of the problem of the division of zero by zero or other 'indeterminate forms' will not stay long lived it the same trials are grounded on a contradiction or on a logical fallacy. While some authors are of the opinion that the division of zero by zero is solved in a logically consistent (Barukčić and Barukčić, 2016), way while respecting the *principium identitatis* as our common ground of science, other authors (Sen and Agarwal, 2016) disagree complete. Saitho (Saitho, 2009) himself prefers a logical contradiction as the starting point of the foundation of his approach to the solution of the problem of the division by zero.

Saitho's (Saitho, 2009) logically inconsistent approach to the division of zero by zero contradicts the basic secured foundations of science (**+1=+1**). Consistently with Saitho's (Saitho, 2009) understanding of the division of zero by zero is that from his contradictory premise or statement (+1=+0, Equation 23), anything follows (**ex contradictione sequitur quodlibet**). In other words, whatever is claimed by someone who is relying on Satiho's dictum concerning the division of zero by zero, its contradiction is also true. Karl Popper (1902 – 1994), as one of the 20th century's greatest Austrian-British philosopher science, in his justified attack against *the principle of explosion* (Latin: ex contradictione sequitur quodlibet), refused to accept contradictions while pointing out what is wrong: "We see from this that if a theory contains a contradiction, then it entails everything, and therefore, indeed, nothing [...]. A theory which involves a contradiction is therefore entirely useless as a theory". (Popper, 2002, p. 429). In this context, Saitho's equality (1/0) = (0/0) is self-contradictory, logically inconsistent and a completely useless approach to solve the problem of the division of zero by zero.

5. Conclusion

Saitho's equality (1/0) = (0/0) is refuted.

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