A solution to dividing by zero

EXPLORING HOW TO ANALYZE AND GIVE VALUE TO DIVIDING BY ZERO

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1 Introduction

1.1 Personal information

My name is Blake Burns. I was formally educated at University of Toronto in Computer Science and am now a financial technology small business owner of Blake Burns Technologies Inc. (https://bbti.io). I am a natural Canadian citizen, and am currently living in Toronto where I have spent most of my life thus far.

1.2 Abstract

Why has dividing by zero always been something that has been undefined? Perhaps it has been a lack of desire to solve this problem, as undefined has been the acceptable answer for such a time for dividing by zero. In this paper, it will be proposed and proven that when 0 is divided by itself it equals to 1 giving a definition and value for a certain, and for all instances, of dividing by zero. The axiom discovered is called the "Blake axiom". The axiom shows that 0 divided by itself is equivalent to 1. Keep in mind this paper is limited to the natural set number space, and does not explore the others, but the same logic in set theory can certainly be applied.

2 Lemmas, Theories, and Proof

2.1 Lemma 1

$$\forall\, x \,\epsilon\, N, S.T.\, x \;\neq\; 0, \;(x/x) \;\equiv\; 1$$

This old lemma is simply stating that any number in the natural number set divided by itself except for 0 is equivalent to 1, which is an accepted truth. For example, $1/1 \equiv 1$, $2/2 \equiv 1$, etc...

2.2 Lemma 2

$$\forall\, x \,\epsilon\, N, x(x/x) \equiv x$$

This lemma is simply stating that any number in the natural number set divided by itself and multiplied by itself is equal to itself as the denominator is negated by the multiplication of the same number.

Quick proof:

$$LHS \equiv RHS$$
$$\text{Let } x(x/x) \equiv (x)$$
$$\text{Dividing both sides by x}$$
$$LHS/(x) \equiv RHS/(x)$$
$$\text{Therefore}$$
$$(x/x) \equiv (x/x)$$
$$\text{Therefore}$$
$$x(x/x) \equiv (x)$$
$$\text{Because } LHS \equiv RHS$$

2.3 The Blake axiom

$$\forall\, x \,\epsilon\, N, (x/x) \equiv 1$$

This theory proposes that for any number in the natural number set when divided by the same number in the same set it is equivalent to 1, giving a definition to division by zero as opposed to the previously seemed undefined divided by zero error, where the reasoning is that when divided by itself it equates to 1 as it is with the entire natural set of numbers except for 0 in previous mathematics.

Given Lemma 1, and it already being common knowledge that every number except for 0 divided by itself is equal to 1, the only thing in order for the theory to be complete and true is to prove that where $x \equiv 0, (x/x) \equiv 1$, which then proves the Blake axiom. Next we will delve into the simple and devious proof that $(0/0) \equiv 1$, which completes and proves the theory given the first and second lemmas.

$$\text{Let } (x/x) \equiv 1$$

$$\text{Let } x \equiv 0$$

$$\text{Then}$$

$$(0/0) \equiv (1)$$

$$\text{Multiplying both sides by zero}$$

$$0 * LHS \equiv 0 * RHS$$

$$\text{Therefore } (0) * (0/0) \equiv (0) * 1$$

$$\text{Using Lemma 2:}$$

$$\text{Then the LHS } (0) * (0/0) \equiv (0)$$

$$\text{Therefore } (0) \equiv (0) * 1$$

$$\text{And } (0) \equiv (0)$$
$$\text{Because } LHS \equiv RHS$$
$$\text{Then for } x \equiv 0, (x/x) \equiv 1$$

By completing the proof of $(x/x) \equiv 1$ where $x \equiv 0$ this proves given Lemma 1 and Lemma 2 that the theory is true, meaning that for every value in the natural number set, when divided by itself is equivalent to 1, even when the value is equivalent to 0, which gives divided by zero not an undefined result.

Let the "Blake axiom" be:

$$\forall\, x \,\epsilon\, N, (x/x) \equiv 1$$

3 Thoughts

Even though I have supplied proofs and my axiom surrounding the division by zero in the natural number set, the other number sets such as the rational, irrational, etc. need to be explored.

In terms of the impact that giving value to division by zero will have, I'm not sure about it's extent, although it may be vast. Of course, it will allow for previously undo-able things to be done. I will provide an example:

Let $(a + b)/0 = k$
Then $a + b = k * 0 = 0$
Also $(a + b)/k = 0$
Where $x = a + b, x = 0$ since $a + b = 0$
Since $(a + b)/0 = 1$ where $a + b = 0$ by the Blake axiom
Because $(0/0) \equiv 1$ like all natural numbers divided by themselves
S.T. $k \equiv 1$ and $(a + b)/0 = 1$ where $a = -b$

This example has shown how constricted the rules are in regards to dividing by 0, and that the numerator must be 0 when dividing by zero in the natural number set otherwise it is not mathematically sound.

Although in other number systems the value of dividing by zero may be different, I have proven that dividing by zero in the natural set can be defined, opposed to the previous belief of it being undefined, and it is mathematically sound. Although it may be troubling for the first time to have a definition for division by zero previously thought impossible, it is not a complicated or troubling solution that has been yielded in the natural number set.

This paper began with me thinking about the difference between 0 divided by itself and the rest of the natural number set divided by itself. I said "Why is 0 the only number of the natural set that cannot be divided by itself and be equal to 1?". This is where my research began: mathematically proving that $(0/0) \equiv 1$.

Whether or not this paper is found by you to be inspiring, I hope it to encourage further research into dividing by zero, and God bless may it yield the mathematical certainties that humankind has been so long without; in this paper namely discovered is the value of using a denominator equivalent to 0, where the numerator also must be 0 where $(0/0) \equiv 1$. The old saying is as we know: "Don't fix a wheel until it's broken". Where dividing by zero was previously broken in mathematics, consider my proposal of what I'm naming the "Blake Axiom" to be a reconstruction and solution to the old undefined problem.

On a final note, may this paper inspire you to solve previously unsolvable things, to break the box of your problems, and to fix them as necessary to facilitate healthy solutions and progress.