The Foundations of Mathematical Physics

Existence vs. Essence

(The Physics of Existentialism)

Charles Keyser

1/08/2023

“Existence (Addition) precedes Essence (Multiplication)” – John Paul Sartre

(Multiplication represents self-awareness as well as entanglement (with others), interaction (with others), etc.) Many other physical concepts involved (entropy, sampling, convolution, etc.) discussed oin other papers by me,

Existence (Addition (“+”))

Existence is represented by the group operation of Addition ($+$):

The declaration n is a syntactical statement that declares that the number represented by the symbol $"n"$ exists (whatever that means to an “observer”. It is assumed that at least one whole number line exists, represented by $\{n\} := (1,2,3,............,n)$.

Then $n = n + 0$ where $"0"$ is syntactical in the context of the group operation of addition (“existence”) means that n is unaffected by whatever the symbol $"0"$ represents, so that $n - n = 0$. The addition of two or more numbers is represented by symbol $"\#"$ where $\# = m + n$ for two existing numbers and in general

$$\#_k := \sum_{i=1}^{k} n_k$$

Prime Number

A prime number is defined by the relation of division $\left(\frac{n}{n}\right)$, where $n := n\left(\frac{n}{n}\right) = 1_n$ and $\frac{n}{n} = \frac{n}{n} = 1_n$ are true for all n so that $\frac{m}{n} = \frac{n}{n} \leftrightarrow m = n$; i.e., “equality” is a syntactical representation of the proposition that **every number** n is **prime in terms of its own base**. Then $n = n + 0$ where $"0"$ is syntactical in the context of the group operation of addition (“existence”).

Note that $1_1 = 1\left(\frac{1}{1}\right)$ is a prime number.

Goldbach's Conjecture

Then Goldbach's Conjecture ("Every even number is the sum of two primes") is satisfied since $n + n = 2n$

Multiplication ("x")

Interaction is defined by Multiplication ($\times$) which is characterizes the relation $\# = m \times n$.

Then $\#^2 := n^2 = n \times n \leftrightarrow m = n$

Russell's Paradox

"A barber in a village shaves all those and only those that don't shave themselves. /does the barber shave himself?" Answer: such a barber cannot exist.

Proof: The actual operation of shaving oneself applies to only one barber in the village (shaving himself)

Such a barber cannot both shave and not shave himself. Consider shaving to be the operation of multiplication.

$$n = n\left(\frac{n}{n}\right) = n(1_n) \leftrightarrow \left(\frac{n}{n}\right) = \left(\frac{n}{n}\right) \leftrightarrow (1_n) = (1_n)$$

$$n^2 = n^2\left(\frac{n}{n}\right) = n^2(1_n) = \left(\frac{n^3}{n}\right) \neq n$$

$$n^2 \neq n$$

$$1_{n^2} = (1_n)^2 \neq 1_n$$

That is, $\#^2 = (m+n)^2 = [m^2 + n^2] + \left[2(m \times n)\right]$ (the binomial expansion for the case where the exponent is equal to two; proved by Newton) where the first term in square brackets reprents the existence of two barbers and the second bracket represents they are shaving each other. Note that $m = 0 \rightarrow \#^2 = n^2$ so a barber shaves himself if and only if the second barber does not exist. So multiplication cannot be defined without the existence of the two elements.

As above, this means that $n^2 \neq n$ (The existence of the barber is not equivalent to the barber shaving himself),

Also, note that:

$\#_n := 1_n$
$\#_{\exists(1)} = 1_1$
$\#_{\exists(2)} = 1_1 + 1_1 = 1_{(1_1+1_1)}$
$\left(\#_{\exists(2)}\right)^2 = \left(1_1 + 1_1\right)^2 = \left[\left(1_1\right)^2 + \left(1_1\right)^2\right] + \left[2\left\{\left(1_1\right)\times\left(1_1\right)\right\}\right]$

where the expression $\left[2\left\{\left(1_1\right)\times\left(1_1\right)\right\}\right] := \left[2\left(1_1\right)^2\right]_{\times}$ is understood to arise from multiplication and the term $\left[\left(1_1\right)^2 + \left(1_1\right)^2\right]_{(\exists)}$ is understood to arise from existence, so that $\left[\left(1_1\right)^2 + \left(1_1\right)^2\right]_{(\exists)}$ is not equivalent to $\left[2\left\{\left(1_1\right)\left(1_1\right)\right\}\right]_{(\times)} (\sim\equiv) \left[\left(1_1\right)^2 + \left(1_1\right)^2\right]_{(\exists)}$.

That is, the operation of multiplication requires two qroup operations, existence (addition) and multiplication (shaving).

(Note: this analysis can also be extended to subtraction, where the neighborhoods are $(n, n-n) \equiv (n, 0)$; that is, $n \neq 0,\ n \times 0 = 0$

Notice that this result applies to all neighborhoods within the village (e.g, Red, Green, Blue, ….); i.e. multinomials where:

difference $\left(\sum_{i=1}^{n} x\right)^n - \left(\sum_{i=1}^{n} x^n\right) = f\left(x_i, n\right)$ so that the

$\left(\sum_{i=1}^{n} x^n\right) = \left(\sum_{i=1}^{n} x\right)^n \leftrightarrow f\left(x_i, n\right) = 0$. But $f\left(x_i, n\right) \neq 0$ so that $\left(\sum_{i=1}^{n} x\right)^n \neq \left(\sum_{i=1}^{n} x^n\right)$

Proof of Fermat's Last Theorem

These relations constitute the proof of Fermat's Last Theorem $c^n \neq a^n + b^n,\ \ \{a, b, n\} > 0,\ n > 2$

Proof by contradiction for $n = 2$ and therefor for $n \geq 2$ using the Binomial Expansion:

$$\text{Assume:}$$
$$c = a + b$$
$$\text{Then:}$$
$$c^n = [a^n + b^n] + \left[f(a,b,n)\right]$$
$$c^n = [a^n + b^n] \leftrightarrow \left[f(a,b,n)\right] = 0$$
$$\left[f(a,b,n)\right] \neq 0$$
$$\therefore c^n \neq [a^n + b^n]$$
$$\text{qed}$$

Note that for $n = 2$ the multiplication term is $2ab$ so the equation of a circle is inconsistent:

$$c^2 = \left[a^2 + b^2\right] + \left[2ab\right] \leftrightarrow c^2 \neq \left[a^2 + b^2\right]$$

The proof is also true for multinomials, since:

$$\left[\sum_i (n_i)^2\right] \neq \left[\sum_i (n_i)\right]^2$$

Goldbach's Conjecture

Global Unity

The global symbol "1" where no base is defined is assumed to mean that it multiplies all numbers, where $\left\{1 \times n\right\} := (1,2,3,...........,1 \times n) \equiv \left\{n\right\} := (1,2,3,...........,n)$ and so is a redundant element and can be omitted from the set of numbers.

Division by 0

$$n = n + 0$$
$$\frac{n}{0} = \frac{n}{0} + \frac{0}{0}$$
$$0 \times n = 0\left(\frac{n}{0}\right) = 0\left(\frac{n}{0}\right) + 0\left(\frac{0}{0}\right) = n + 0\left(\frac{0}{0}\right) = n + 1_0 = n + 0 = n$$

Then $0 = 0\left(\dfrac{0}{0}\right)$ is a prime number but does not affect the existence of n

Negative Numbers do not Exist

There are no negative numbers. Elements indicated by a negative sign results from positive differences:

$$-k = n - m,\ \ m > n$$
$$m - k = n,\ n > 0$$
$$n + 0 = n \leftrightarrow n - n = 0$$

If negative numbers do not exist, then neither do square roots of negative numbers (imaginary numbers):

$$i = \sqrt{-1}$$
$$i^2 = \left(\sqrt{-1}\right)\left(\sqrt{-1}\right) = \sqrt{(-1)(-1)} = \sqrt{(-1)^2} = \sqrt{(1)^2} = 1 \neq -1$$
$$i^2 \neq -1$$

$$n = n\left(\frac{n}{n}\right) = n\left(1_n\right) \leftrightarrow \left(\frac{n}{n}\right) = \left(\frac{n}{n}\right) \leftrightarrow \left(1_n\right) = \left(1_n\right)$$
$$n^2 = n^2\left(\frac{n}{n}\right) = n^2\left(1_n\right) = \left(\frac{n^3}{n}\right) \neq n$$
$$n^2 \neq n$$
$$1_{n^2} = \left(1_n\right)^2 \neq 1_n$$

(Imaginary numbers are complex only for those who assume they are somehow real).

Note that:

$$\psi : a + ib$$
$$\psi^* : a - ib$$
$$\psi\psi^* = (a + ib)(a - ib) = a^2 + (ib)a - a(ib) - i^2(b)$$

Note that $+(ib)a - a(ib) \neq 0$ only if the terms do not commute (a fundamentqal property of real arithmetic: $\{\varphi\} = \{mn\} \leftrightarrow \{mn\} = \{nm\}$, and $\psi\psi^* = \# \leftrightarrow b = 0$

Matrices (Dimension)

Note that the existence single number n is represented by the "count" matrix in one dimension.

$n = Tr|n|$ and since there is no other number, $Det|n| = 0 = Det\begin{vmatrix} n & 0 \\ 0 & 0 \end{vmatrix} = Det\begin{vmatrix} 1_n & 0 \\ 0 & 0 \end{vmatrix}$

If two numbers exist but do not multiply each other, then

$m+n=Tr\begin{vmatrix} m & 0 \\ 0 & n \end{vmatrix}$ but $Det\begin{vmatrix} m & 0 \\ 0 & n \end{vmatrix}=m\times n=0$ is not defined.

Note that this is also true for $m=n$

If two numbers exist and multiply each other, then

$$\#_{(m+n)^2}:=(m+n)^2=\left[m^2+n^2\right]+\left[2mn\right]$$

This expression is represented by the relation

$$\#_{(m+n)^2}:=Tr\begin{vmatrix} m^2 & 0 \\ 0 & n^2 \end{vmatrix}+Det\begin{vmatrix} m & n \\ -m & n \end{vmatrix}=\left[m^2+n^2\right]+\left[2mn\right]$$

Note that

$$Tr\begin{vmatrix} m^2 & 0 \\ 0 & n^2 \end{vmatrix}=Tr\begin{vmatrix} m & 0 \\ 0 & n \end{vmatrix}^2$$

Four Dimensions

Note that

$$Tr\begin{vmatrix} n & 0 & 0 & 0 \\ 0 & n & 0 & 0 \\ 0 & 0 & n & 0 \\ 0 & 0 & 0 & n \end{vmatrix}=4n=n+n+n+n \text{ but that}$$

$$Tr\begin{vmatrix} n & 0 & 0 & 0 \\ 0 & n & 0 & 0 \\ 0 & 0 & n & 0 \\ 0 & 0 & 0 & n \end{vmatrix}^2=\left(n+n+n+n\right)^2=n^2+n^2+n^2+n^2+f\left(2,n\right)$$

$$\neq n^2+n^2+n^2+n^2=Tr\begin{vmatrix} n^2 & 0 & 0 & 0 \\ 0 & n^2 & 0 & 0 \\ 0 & 0 & n^2 & 0 \\ 0 & 0 & 0 & n^2 \end{vmatrix},\ f\left(2,n\right)\neq 0$$