The Bottom Line

Charles Keyser

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The Relative Unit Circle (RCU)

Fermat's Last Theorem applied to Multi-nomials

Math Fundamentals

In the discussion below, all numbers are defined as positive natural numbers unless defined by division.

Positive Definiteness (Existence)

The existence of a number n is characterized by its positive definiteness: $n \geq 0$ Negative numbers exist only as differences between positive numbers:

$$\begin{aligned}
&k, m, n > 0 \\
&m > n \\
&-k = n - m \\
&m - k = n \\
&n - n = 0 \leftrightarrow n = n
\end{aligned}$$

Prime Numbers

All numbers are prime relative to their own base:

$n := n\left(\frac{n}{n}\right) = n\left(1_n\right)$: ($1_n$ is "One to the base n". $\left(1_n\right) = \left(1_m\right) \leftrightarrow m = n$)

$\left(1_n\right) = \frac{n}{n}$ (Self-division is the only allowed division operation for prime numbers)

Goldbach's Conjecture

"Every even number is the sum of two primes" follows immediately:

$$n + n = 2n$$

Fermat's Last Theorem

Hypothesis: $c^n \neq (a+b)^n$

Thesis (Proof):

Consider the sum $c = a + b$ Then

$$c^n = (a+b)^n = [a^n + b^n] + f(a,b,n) \quad \text{(Binomial Expansion)}$$

$$c^n = (a+b)^n \leftrightarrow f(a,b,n) = 0$$

$$f(a,b,n) \neq 0$$

$$\therefore c^n \neq (a+b)^n \quad \text{(qed)}$$

Russell's Paradox

"A barber in a village shaves all those and only those that don't shave themselves."

(Hint: the paradox specifies only one barber; define shave as the group operation of multiplication)

$$1 = \frac{1}{2} + \frac{1}{2}$$

$$1^2 = \left\{\frac{1}{2} + \frac{1}{2}\right\}^2 = \left[\left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^2\right] + 2\left[\left(\frac{1}{2}\right)\left(\frac{1}{2}\right)\right] = \left[2\left(\frac{1}{2}\right)^2\right] + \left[2\left(\frac{1}{2}\right)^2\right]$$

where $\left[\left(\frac{1}{2}\right)^2 + \left(\frac{1}{2}\right)^2\right]$ is the sum of elements under existence (addition) and $\left[2\left(\frac{1}{2}\right)^2\right]$ is the product of elements under multiplication (change).

$\therefore 1 \neq 1^2$ (qed)

There is no such barber; the group operation of multiplication requires two elements.

(i.e., a number cannot both multiply and not multiply itself.)

Ratios are not prime numbers:

$$x := vt$$

$$\frac{x}{t} = v\left(\frac{t}{t}\right) = v(1_t) \quad (1_t) \text{ is a single "clock tick"}$$

Assume:

$$\frac{x}{t} = \left(\frac{x}{t}\right)\frac{\left(\frac{x}{t}\right)}{\left(\frac{x}{t}\right)} = \left(\frac{x}{t}\right)\frac{(xt)}{(xt)}$$

$$\frac{x}{t} = xt \leftrightarrow xt = xt^2$$

$$x = x \leftrightarrow t = t^2$$

$$t = 1$$

$$1^2 \neq 1 \quad \text{(Russell's Paradox)}$$

$$\therefore \frac{x}{t} \text{ cannot be a prime number}$$

qed

$v = v\left(\frac{v}{v}\right) = v(1_v)$ is a prime number if not characterized by division.

$1 = \frac{1}{2} + \frac{1}{2}$ is “odd”, so does not satisfy Goldbach’s conjecture since $\frac{1}{2}$ is not a prime number.

$2 = 1 + 1$ is an even number.

$n = \frac{n}{2} + \frac{n}{2}$ is “odd” $\{o\}$ $\quad n+1 = \frac{n+1}{2} + \frac{n+1}{2} \leftrightarrow 2(n+1) = 2n+2$ is “even” $\{e\}$

The totality of numbers + is given by even + odd = n+(n+1) = 2n+1 $\{e\} + \{o\} = \{o\}$

(There is only one Universal origin if there is only one number line)

Imaginary Numbers (Not)

Imaginary numbers are complex only for those who think they may or may not be real.

Hypothesis: Imaginary numbers do not exist (If there are no negative numbers, then there are no square roots of negative numbers).

Proof

Hypothesis: $(-1)(-1)=1^2$

Thesis:

$$
\begin{aligned}
&-1 = n-(n+1)\\
&(-1)(-1) = n^2+(n+1)^2-2n(n+1)\\
&= n^2+\left[n^2+2n+1\right]-2n^2-2n\\
&= \left[2n^2-2n^2\right]+\left[2n-2n\right]+1^2\\
&= 2\left[n^2-n^2\right]+2\left[n-n\right]+1^2\\
&= 0+0+1^2\\
&= 1^2\\
&\therefore (-1)(-1)=1^2 \quad \text{qed}\\
&\text{Corrolary: } \sqrt{(-1)(-1)}=\sqrt{1^2}=1
\end{aligned}
$$

(This procedure merely displaces the origin by one unit on the number line)

Alternatively:

$$\forall n: -1 = n - (n+1) = \left(n-n\right) - 1 = 0 - 1$$
$$\left(-1\right)\left(-1\right) = [0-1]^2 = 0^2 - 2\left(1\right)\left(0\right) + 1^2 = 1^2$$
$$\sqrt{\left(-1\right)\left(-1\right)} = 1$$
$$i := \sqrt{\left(-1\right)}$$
$$i^2 = \sqrt{\left(-1\right)}\sqrt{\left(-1\right)} = \sqrt{\left(-1\right)\left(-1\right)} = \sqrt{1^2} = 1$$
$$i^2 = 1 \neq -1$$

Forces

Note on forces:

The concept of a force implied motion: either velocity or acceleration of a moving mass. If the Universe without the particle is completely empty than an external mechanism (”god”) must have created the particle. As an alternative, there may be an empty patch far enough from galaxies relative to background radiation (“noise”) which may itself be moving relative to the background radiation.

If a moving mass (m) enters an empty patch of the Universe, there is no interaction with any other elements from the point of entry at the border so that the accelerations (f=ma) provided by all previous interactions in the “noise” becomes zero, and the motion of the mass is characterized by a velocity and thus a momentum (P = mv) . Since v includes all previous accselerations, this is then expressed globally as f = mf(a)= m(v) where v = f(a)

consider an empty (or patch of a) universe except for a single force:

$$\# = 0 + f$$

1. $f \geq 0 \quad -f' = f + f'', \leftrightarrow f'' - f' = f \geq 0$
2. $f - f = 0 \leftrightarrow f = f$
3. $f = -f \leftrightarrow f + f = 2f = 0$
4. $2f = 0 \leftrightarrow f = 0$

Since ether is no coordinate system associated with the force, there is no definable position (“Origin”), so that $\# = 0 + f = f$.

Consider now a second equal force where the total force $F = f + f = 2f$

Non-interacting forces

If the two forces do not interact, they can be characterized by two parallel lines, where the origin on each is still undefined. The system is then represented by the matrix

$$\# := \begin{vmatrix} f & 0 \\ 0 & f \end{vmatrix} \leftrightarrow \#^n = \begin{vmatrix} f & 0 \\ 0 & f \end{vmatrix}^n = \begin{vmatrix} f^n & 0 \\ 0 & f^n \end{vmatrix}$$

And in particular for $n = 2$,

$$\#^2 = \begin{vmatrix} f & 0 \\ 0 & f \end{vmatrix}^2 = \begin{vmatrix} f^2 & 0 \\ 0 & f^2 \end{vmatrix}$$

$$Tr\begin{vmatrix} f & 0 \\ 0 & f \end{vmatrix} = 2f,\ Det\begin{vmatrix} f & 0 \\ 0 & f \end{vmatrix} = f^2$$

(Note that the derivative of the determinant is equal to the trace:

$\frac{df^2}{df} = 2f$. (This is actually the "gauge" condition which is only true if the definition of derivative is valid)

For $f = 1$ the following follows:

$$|2(1)| := \begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix},\ Tr\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} = 2(1) = 1+1,\ Det\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix} = (1)^2$$

The definition of the determinant is a consequence of the matrix characterization of juxtaposition of vectors; notice that for component by component multiplication, $(1)(0) = (0)(1) = 0$

Equal and Opposite interacting forces

This defines interaction at a mutual origin (point) $(0,0) = (\text{anywhere,anywhen})$ in an otherwise empty Universe in which multiplication between the forces is defined. Two forces interact if and only if they are on the same number line where the interacting forces meet at a unique position on the line characterized by the origin coordinate $(0,0)$ Relative motion of the two particles toward each other is designated as positive which disappears at the moment of impact at the origin. If a discrete number line is established between the boundaries of the patch, then the origin is a the center of this number line.

Then velocity can be defined over the number line as $2x = v(2t) \leftrightarrow x = vt$ where x is defined as a "length" or distance from the boundary of the empty patch to its center (the origin)

If the two forces interact as equal and opposite, then $f = f$ and the total contribution to the force $F = \frac{f}{2} + \frac{f}{2}$ so that

$$\left(F^2\right)_{(+,\times)} = \left(\frac{f}{2} + \frac{f}{2}\right)^2 = \left[\left(\frac{f}{2}\right)^2 + \left(\frac{f}{2}\right)^2\right]_+ + \left\{2\left(\frac{f}{2}\right)\left(\frac{f}{2}\right)\right\}_\times = 4\left(\frac{f^2}{4}\right)_{(+,\times)} = \left(f^2\right)_{(+,\times)}$$

where $\left[\left(\frac{f}{2}\right)^2 + \left(\frac{f}{2}\right)^2\right]_+ = 2\left(\frac{f^2}{4}\right)_+ = 2\left(\frac{f^2}{4}\right)_+ = \left(\frac{f^2}{2}\right)_+$

characterizes the existence of the interacting elements under addition $(+)$

and

$$\left\{2\left(\frac{f}{2}\right)\left(\frac{f}{2}\right)\right\}_\times = 2\left(\frac{f^2}{4}\right)_\times = \left(\frac{f^2}{2}\right)_\times$$

characterizes the existence of the interaction under multiplication ($\times$).

The definition of "rest mass"

The result of the interaction at the origin can than be characterized by $m_0 = f^2$

Matrix representation

Note that

$$f^2 = Tr\begin{vmatrix} \left(\frac{f}{2}\right)^2 & 0 \\ 0 & \left(\frac{f}{2}\right)^2 \end{vmatrix} + Det\begin{vmatrix} \left(\frac{f}{2}\right) & \left(\frac{f}{2}\right) \\ -\left(\frac{f}{2}\right) & \left(\frac{f}{2}\right) \end{vmatrix}$$

That is,

$$1^2 = Tr\begin{vmatrix} \left(\frac{1}{2}\right)^2 & 0 \\ 0 & \left(\frac{1}{2}\right)^2 \end{vmatrix} + Det\begin{vmatrix} \left(\frac{1}{2}\right) & \left(\frac{1}{2}\right) \\ -\left(\frac{1}{2}\right) & \left(\frac{1}{2}\right) \end{vmatrix} \neq \frac{1}{2} + \frac{1}{2} = 1$$

$$1^2 \neq 1$$

Compare this with the "spinor" characterization of vector physics)

That is, $1^2 \neq 1$, which is the interpretation of Russell's paradox:

"A barber in a village shaves all those and only those that don't shave themselves. Does the barber shave himself" - Bertrand Russell

Ans: No such barber exists; a barber cannot both not shave and shave himself.

(Hint: the group operation of shaving is analogous to multiplication of unit barbers; two elements must exist for such an operation.)

Note that

$\left(F^2\right)_{(+,\times)} = \left(f^2\right)_{(+,\times)} \neq \left[\left(\frac{f^2}{2}\right) + \left(\frac{f^2}{2}\right) + \left(\frac{f^2}{2}\right) + \left(\frac{f^2}{2}\right)\right]_+$ where the r.h.s. characterizes the existence of four forces but no interactions where

$$\left|4\left(\frac{f}{2}\right)^2\right|_+ := \begin{vmatrix} \left(\frac{f}{2}\right)^2 & 0 & 0 & 0 \\ 0 & \left(\frac{f}{2}\right)^2 & 0 & 0 \\ 0 & 0 & \left(\frac{f}{2}\right)^2 & 0 \\ 0 & 0 & 0 & \left(\frac{f}{2}\right)^2 \end{vmatrix} = \left(f^2\right)_+$$ but no multiplication (interaction, "shaving")

between the different dimensions is defined.

Note also that the trace of the Electromagnetic Tensor is 0, so no equal and opposite electromagnetic forces are defined.

An Empty Sphere

Consider an empty sphere somewhere between galaxies where there are no elements, even CBR. Then consider two forces at the boundary connected by an axis through the center. If there is no interaction from the CBR at the boundary, the acceleration of the force particles will be zero, but they will still have momentum, with velocity relative to the center of the sphere (and thus each other); directed inwards toward the center, both velocities will be positive, if outward from the sphere, the velocities will be negative.

Since the moving elements were created initially by forces from the CBR, they still have energy proportional to the forces, and so will have equal and opposite momentum when they meet at the center. The energy will then be the result of equal and opposite momenta (forces) so that the velocity is zero at the center, but the "rest mass" (not moving wrt the center) is now defined as:

$m_0 := f^2 = P^2$ where the sources of the forces are defined at the opposite points on the sphere, and the rest mass is defined at the center, with the sphere an arbitrary size, but $r = vt$ for arbitrary radius () ($r = c\tau$) for a photon equivalent mass created on the surface of the earth and transported to the boundary of the sphere without interaction, where $c = \frac{1}{\sqrt{\varepsilon_0 \mu_0}}$ via the vector analysis by Maxwell's equations, from the Coulomb and Ampere experimental force laws. These forces will be orthogonal to tangent planes at the surface of the sphere.

If all such (equal and opposite) forces are evaluated over the surface(s) of the all spheres at the center "origin" (which is actually a sensor) then all of the mass of the sphere appears as a point particle at the center of all such spheres. (If only a hemisphere is considered, then the model corresponds to peripheral vision, half the force from behind arriving at the center (i.e., from behind)

If the CBR is in thermal equilibrium, the sphere will be motionless with respect to it. An imbalance in the source forces will then cause the "rest mass" (and thus the sphere) to move relative to the CBR.

Since the rest mass does not radiate, its only components are due to incoming (equal and opposite) forces, so the rest mass is a "black hole" relative to the CBR. In a larger perspective, the CBR then appears as "noise" that is not interacting with the black hole:

$m' = m_0 + m_{CBR}$; the CBR is often modeled as a Gausian spectrum in this context.

This model is characterized by the matrix relation:

$$\# := Tr\begin{vmatrix} m_0 & 0 \\ 0 & m_{CBR} \end{vmatrix} = m_0 + m_{CBR}$$

If the “rest mass” interacts with the CBR (gravitationally), then the relationship is given by

$$\#^2 := Tr\begin{vmatrix}(m_0)^2 & 0 \\ 0 & (m_{CBR})^2\end{vmatrix} + Det\begin{vmatrix}m_0 & m_0 \\ -m_{CBR} & m_{CBR}\end{vmatrix} = \left[(m_0)^2 + (m_{CBR})^2\right] + \left[2(m_0)(m_{CBR})\right]$$ where the

interaction term $\left[2(m_0)(m_{CBR})\right]$ is modified by a $\frac{1}{r^2}$ due to radiation in other directions than the rest mass at the source (far field).

For an individual source relative to the total rest mass, the relation is given by $f_g := f_0 + f_b$, where f_b is the force at the boundary.

Then

$$m_g := \left(f_g\right)^2 = \left[f_0 + f_b\right]^2 = \left[\left(f_0\right)^2 + \left(f_b\right)^2\right] + 2\left(f_0\right)\left(f_b\right) = \left[m_0 + m_b\right] + \left[2\left(m_0\right)\left(m_b\right)\right]$$

Where m_g is the "gravitational mass" of the total system, $\left[m_0 + m_b\right]$ characterizes the existence of the two forces, and $\left[2\left(m_0\right)\left(m_b\right)\right]$ characterizes their interaction. Setting $\left(m_b\right) = 2G(m_0)$ and including the $\frac{1}{r^2}$ law from the perspective of the c.m. ($r \geq 1$) yields the expression

$m_g := \left[m_0 + m_b\right] + \frac{\left[G\left(m_0\right)\left(m_0\right)\right]}{r^2}$ where the term $\frac{\left[G\left(m_0\right)\left(m_0\right)\right]}{r^2}$ is analogous to Newton's Force Law, and the term $\left[m_0 + m_b\right]$ expresses the existence of the two masses. Note that the LaGrange point (where the two forces are balanced) exists at the point $\bar{r} = \frac{\left[\left(m_0 r_0\right)\left(m_b r_b\right)\right]}{\left[\left(m_0 r_0\right) + \left(m_b r_b\right)\right]}$ so that the interaction term becomes $\frac{\left[G\left(m_0\right)\left(m_0\right)\right]}{\left(\bar{r}\right)^2}$ evaluated at the LaGrange point $\frac{1}{\left(\bar{r}\right)}$ between the elements for each opposing path.