# Cauchy completeness and physics

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**Abstract** It is well known to all mathematicians that the real numbers (ie .rationals & irrationals) can be constructed from Cauchy completeness i.e. real# sets as rational Cauchy sequence limits. So all we did here is show we postulated real#0 by using it to derive a associated rational Cauchy sequence. We did this because that same postulate (of real#0) math *also* implies fundamental theoretical physics. See "Results".

But **0**≡0X0,1≡1X1;1≡1+0.So with the simplest algebraic definition of **0** *and* 1 being **z=zz** we hypothesize

**Postulate** *real* number **0** (so real1) *if* z'=**1** and **z'=0** are substituted (plugged) into z'=z'z'+C **eq1** results in *some* C=0 constant(ie δC=0). Thus

•Plug in **z=0**=$z_o$=z'in **eq1.**To find ***all* C** substitute z' on left (**eq1**)into right z'z' repeatedly andget iteration $z_{N+1}=z_Nz_N$-C. Constraint **δC=0** requires we reject the Cs for which -δC=δ($z_{N+1}$-$z_Nz_N$) =δ(∞-∞)≠0. The Cs that are left over define the **Mandelbrot set** $C_M$=C with asubset C=0,fractal scales δz'=$10^{40N}$δz,N=integer These fractal scales having their own δz then perturb that **z=1** so put z=**1**+δz in **eq.1** to get δz+δzδz=C (3) Define N≤0 as 'observable'fractal scales. Thus define the'observer'fractal scales as N≥1 implying |δz|>>1 Then solve equation 3 as a quadratic equation so δz=$(-1\pm\sqrt{1+4C})/2$=dr+idt if C≤ -¼ (complex) (4) Mandelbrot set iteration (ie., $z_{N+1}=z_Nz_N$-C) for this δC=0 *extremum* C=-¼ is a rational number Cauchy sequence -¼, -3/16, -55/256, ...,**0** thereby proving the hypothesis of our above postulated *real#0* math **postulating** literally nothing(0) (except **real1** *since* real#**1**=1+0≡1∪0.)

•Plug in **z=1** in z'=1+δz in **eq1**, So **δC=0**= (eq1 implies eq3)=δ(δz+δzδz)=δδz(1)+δδz(δz)+(δz)δδz= (observer |δz|>>1) ≈δ(δzδz)=0=(plug in eq.4) =δ[(dr+idt)(dr+idt)] = δ[($dr^2$-$dt^2$)+i(drdt+dtdr)]=0 (5)

=2D δ[(Minkowski metric, c=1)+i(Clifford algebra→eq.7a)] (≡Dirac eq)

Factor real eq.5 δ($dr^2$-$dt^2$)=δ[(dr+dt)(dr-dt)] =0=[[δ(dr+dt)](dr-dt)]+[(dr+dt)[δ(dr-dt)]] =0 (6)

so -dr+dt=ds,-dr-dt=ds≡$ds_1$(→±**e**) Squaring&eq.5 gives circle.in e,ν (dr,dt) 2nd,3rd quadrants (7)

& dr+dt=ds, dr-dt=ds, dr±dt=0, light cone (→ν,$\bar{\nu}$) in same (dr,dt) plane 1st,4th quadrants (8)

& dr+dt=0,dr-dt=0 so dr=dt=0 defines vacuum (while eq.4 derives space-time) (9)

Those quadrants give *positive* scalar drdt in eq.7 (if *not* vacuum) so imply the eq.5 *non* infinite extremum imaginary≡drdt+dtdr=0≡$\gamma^i dr\gamma^j dt+\gamma^j dt\gamma^i dr=(\gamma^i\gamma^j+\gamma^j\gamma^i)$drdt so $(\gamma^i\gamma^j+\gamma^j\gamma^i)$=0, i≠j (from real eq5 $\gamma^j\gamma^i$=1) (7a)

Thus from eqs5,7a: $ds^2$= $dr^2$-$dt^2$=$(\gamma^r dr+i\gamma^t dt)^2$ Note how eq5 and $C_M$ just fall (pop) out of eq.1, amazing! (These quadrants in e,ν plane *illustrate* the 4 Boson SM 4 rotation extreme math of ref.1, eq.12)

•**Both z=0,z=1** together (in eq1. Use orthogonality to get (2D+2Dcurved space)). Thus (z=1)+(z=0)= ($dx_1$+i$dx_2$)+($dx_3$+i$dx_4$)≡dr+idt given $dr^2$-$dt^2$=$(\gamma^r dr+i\gamma^t dt)^2$ *if* $dr^2$≡$dx^2$+$dy^2$+$dz^2$ (3D orthogonality) so that $\gamma^r dr\equiv\gamma^x dx+\gamma^y dy+\gamma^z dz$, $\gamma^i\gamma^j+\gamma^j\gamma^i$=0, i≠j,$(\gamma^i)^2$=1, rewritten ($\kappa_{ii}$ from N=0 $C_M$ perturbation of N=1, eqs 7,13) as $(\gamma^x\sqrt{\kappa_{xx}}dx+\gamma^y\sqrt{\kappa_{yy}}dy+\gamma^z\sqrt{\kappa_{zz}}dz+\gamma^t\sqrt{\kappa_{tt}}idt)^2=\kappa_{xx}dx^2+\kappa_{yy}dy^2+\kappa_{zz}dz^2-\kappa_{tt}dt^2=ds^2$. Multiply both sides by 1/$ds^2$ and $\delta z^2=\psi^2$ use circle -i∂δz/∂r=(dr/ds)δz inside brackets( ) get 4D QM $\gamma^\mu(\sqrt{\kappa_{\mu\mu}})\partial\psi/\partial x_\mu=(\omega/c)\psi$≡Newpde for e,ν, $\kappa_{oo}$=1-$r_H$/r =1/$\kappa_{rr}$, $r_H$=$e^2$X$10^{40N}$/m (N=. -1,0,1.,).So $\kappa_{\mu\nu}$ carries the covariance & **Postulate** 1→**Newpde**

**Results:** of (merely plugging z'=0,z'=1 into eq.1) **postulate1**: (1) backups: davidmaker.com

Newpde: **N**=0,stable r=$r_H$ composite(part II) 3e $2P_{3/2}$ is baryons(QCD not required), SM is the extreme of 4 e,ν quadrant rotations. **N**=-1 is GR. Expansion stage of **N**=1 scale δz'=δ$ze^{iwt}$ Dirac eq zitterbewegung oscillation is the cosmological expansion, **N**=0 the 3rd order Taylor expansion component(1) of $\sqrt{\kappa_{oo}}$ gets the anomalous gyromagnetic ratio so don't need the renormalization infinities. So we get the physics here

Math: We use that **1**+c≡1∪c to define above *list-define* (ring-field) algebra and note again that iteration gives a Cauchy sequence limit of real# eigenvalues, so we get the rel# math as well with no new axioms.

Thus (with the math&physics) we understand *everything* (eg GR, cosmology, QM,e,ν SM, baryons, rel#).

•So the *simplest idea imaginable* 1 implies all *fundamental math-physics.* no more, no less(eg simply 4D)

**Conclusion:** So by merely (plugging 0,1 into eq.1) **postulating 1**, out pops the universe, BOOM! easily the most important discovery ever made or that will ever be made again. We finally figured it out.

Reminder: The algebraic *definition of 1* is z=zz (note z= **0,1**) *if* C=0 in the below definition:

Summary: This

Theory is 1 The rest is a (rel#1) definition.

| **Theory** | Real# 1 **definition** |
|---|---|
| **Postulate 1** | is defined algebraically if **z=1** and **z=0** (plugged) into z=zz+C eq1 gives some C=0 constant(ie δC=0) |

So can plug (δC=0 &) **z=0** into **eq1** iteration(to get *all* C) get 2D (complex) **Mandelbrot** set $C_M$=C (fractal scale N)
(this iteration also results in a Cauchy sequence confirming 1 is a real# comes from our above '1' definition.)
plug (δC=0 &) **z=1** into **eq1** get 2D **Dirac** equation ((N=1) ≡ 'observer') perturbing N=0 (z=1) "observables"
combine **both** 2D+2D=4D **Newpde** using $(dx_1+idx_2)_{z=0}+(dx3+idx_4)_{z=1}$ =dr+idt & dr 3D orthogonalization
therefore

**postulate 1→ Newpde** (So we get all of physics and 1+C→1∪ algebra and Real#math (1 such $C_M$ iteration is Cauchy) **everything** that is physical, no more, no less. See backups at davidmaker.com eg., in introduction"
Ultimate Occam's razor postulate 1 so ultimate physics theory, So understand universe completely