ZULF'S STANFORD ANALYSIS FALL 2013 QUAL

ZULFIKAR MOINUDDIN AHMED

1. Preamble: Seeking Tenure At Stanford For Four-Sphere Theory And Quant Human Nature Results

I am seeking tenured full professorship at Stanford University right away based on success with my four-sphere theory which is my original work that began in 2008 in a loft in Williamsburg Brooklyn and showed success by 2018. It was done without any financial support of any university or government, and without any supervision. I successfully challenged general relativity, quantum field theory, and expansionary cosmology. I also have new and original empirical and not just theoretical results on universal human moral nature, vindication of Aristotle's virtue-eudaimonia theory as well as extensions to include virtues of romantic love for life satisfaction for all human beings. My work can be found archived in Github available for public [1, 2]. I am in conflict with *Bill Gates* and he has used his powers to (a) steal money from me, (b) starve me of income \$620 million, \$120 million from D. E. Shaw & Co. and \$500 million from Madam Christine Lagarde of ECB. These are for work on medium frequency alpha strategy by discovery of pure arbitrage opportunities in 1-15 minute frequency in all asset classes and plans for Quantitative Positive Psychology technology application projects for Global Life Satisfaction. Bill Gates had violated all international and national laws to destroy my life altogether and blockade all funds. He is has been condemned to death by UN Security Council for War Crimes but United States Government is lethargic in co-operating. I would like to get notice of a tenure decision by Stanford as soon as possible as I have been without any significant income for more than a decade and have to get my own pad and re-establish normal life. At the moment I am living with my aunt in Allen Texas dealing with a great deal of verbal abuse and other problems and being accosted by local government officials on trumped up charges, being sent to mental health incarceration for frivolous charges, and other problems. Co-operation of Stanford in swift tenure decision and getting me funds immediately would be welcome. I plan to buy some properties in Mission District San Francisco and settle there and have a family while working with Stanford as an Adjunct Professor.

All the work that I do is my own for the Stanford Mathematics Qual unless explicit references are given. I am a Princetonian and take Honour Code very seriously. I am very proud of my extremely strong Virtuous Character. Here is a profile of my ranked Virtues from VIA-120. The top 5-10 are most significant virtues here.

Date: January 30, 2022.

	Rank	Virtue	Class
1	1	Love	(Humanity)
2	2	Creativity	(Wisdom)
3	3	Honesty	(Courage)
4	4	Curiosity	(Wisdom)
5	5	Spirituality	(Transcendence)
6	6	Hope	(Transcendence)
7	7	Bravery	(Courage)
8	8	Humor	(Transcendence)
9	9	Forgiveness	(Temperance)
10	10	Perspective	(Wisdom)
11	11	LoveOfLearning	(Wisdom)
12	12	AppreciationOfBeautyAndExcellence	(Transcendence)
13	13	SocialIntelligence	(Humanity)
14	14	Zest	(Courage)
15	15	Gratitude	(Transcendence)
16	16	Self-Regulation	(Transcendence)
17	17	Fairness	(Justice)
18	18	Perserverence	(Courage)
19	19	Judgment	(Wisdom)
20	20	Leadership	(Justice)
21	21	Kindness	(Humanity)
22	22	Prudence	(Temperance)
23	23	Teamwork	(Justice)
24	24	Humility	(Temperance)

2. The Purpose Of These Tests And Timing

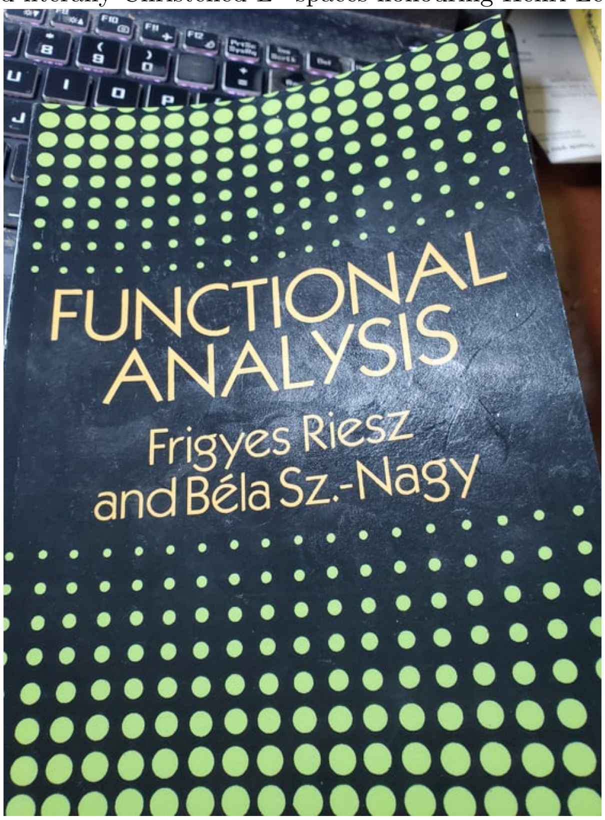
I generally do ten problems in roughly 2-4 days. I am 49 and do not try to rush any problems. The goal is really to test my weaknesses in Analysis. I had taken Real Analysis with Nick Katz at Princeton sophomore year. That's right it was 1992. Then I took functional analysis with Peter Sarnak in 1993. Four-Sphere Theory developed from 2008 in my mind primarily based on my strong understanding of spectral theorem for compact self-adjoint operators and its applications for compact riemannian manifolds. I was examining physics when I realised that quantisation of energy in the actual universe could have a global geometric origin and eventually was led to four-sphere theory with exact homogeneous geometry for absolute space with measured cosmological constant $\Lambda = 1.11 \times 10^{-52} m^{-2}$ being its curvature. This theory has shown remarkable success and this achievement is tenure-worthy alone.

These problems from Stanford Mathematics Ph.D. Quals I am doing to sharpen depth of understanding of Analysis which now I need for Four-Sphere Theory and other efforts.

3. Some More Commentary On Analysis

I like Stanford Analysis Problems partly because I am not just trying to gain deeper skills in Analysis but also attempting to have a deeper sense of history of Science and Mathematics. In fact on many issues it is *history* that gives me deeper insight than particular problems. It is also fascinating. I am also 49, not so young any more and it is interesting to appreciate the development in a timed context, to have some sense of momentum of history. You see the human race system has its unknown laws, and there are regularities.

I obtained a copy of F. Riesz-B. Sz-Nagy not long ago. It's this book, and of course as all Analysts are familiar, F. Riesz is one of the greatest Analysts in history and literally Christened L^p spaces honouring Henri Lebesgue.



They outline a brief history of integral equations starting with Jean Baptiste Joseph Fourier and Fourier inversion formula from 1811.

Then Niels Henrik Abel published some works in 1823 and considered the integral equation

$$g(x) = \int_a^b \frac{f(y)}{(x-y)^\alpha} dy$$

And he found a solution. I am just astounded by the beautiful work of Niels Henrik Abel. He died of tuberculosis at 26.

You know I am just astounded by how totally worthless and useless this Bill Gates is. The miserable wretch talks all sorts of nonsense about white superiority and he knows nothing about great geniuses who were actually white. If he actually knew how this Norwegian man struggled in poverty to do work that transformed the entire future of mathematics, he would not be the rotten dirty disgusting worthless son of a bitch worthy of incineration in a gas chamber every day as he is.

Anyway, this is fascinating, and what did this man Volterra do? Volterra integro-differential equations for elastic media. Equations of type

$$\int_a^b H(x,y)f(y)dy = g(x)$$

and

$$f(x) + \int_a^b K(x,y)f(y)dy = g(x)$$

were studied first by Vito Volterra in 1896. The kernels are called Volterra when $K(x,y)$ is defined in $a \leq y \leq x \leq b$. Erik Ivar Fredholm also studied them. This is extremely important to understand, that Banach Spaces and Hilbert Spaces and operators between them, continuity and completeness and the rest of the infrastructure exists so that these sorts of equations could be solved.

This is quite interesting, because, I used Hilbert space of square-integrable spinor fields to define the matter fields in the universe. *That fact* is extremely important. I did not invent $L^2(\Gamma\Sigma S^4)$. I mean I would never invent something like this. It's a lot of work and it could have dented my beautiful manicured nails. I expect these industrious *Analysts* to do those sorts of things so I can have their work and become immortal using these. So they actually did produce something spectacular. Let me assure you, my dear readers, that these Analysts actually produced the perfect infrastructure for all of physics, i.e. measurable spinor fields on the scaled four-sphere, and these are what the stuff of life and Nature are made of. They were concerned with solving some of these equations. That's good. I am most pleased. So while they were thinking about solving these problems, they put together the description of fundamental objects of Nature.

Thank God that they had no idea about this and I, Zulfikar Moinuddin Ahmed, could take credit for the greatest discovery in human history. It's fitting in a way. I think it makes perfect sense.

4. Zulf Discovers That Bill Gates Used His Powers To Experiment With Me Regarding His Thoughts About Sexual Orientation

During my sleep I came across English Footballers who got interested in the situation with me and Bill Gates. They discovered that he invaded my meta and clamped down his Thoughts On Sexual Orientation and proceeded to do vile experiments on me. I am strongly Virtuous and zealously Heterosexual and consider my Sexuality to be Sacred turf. I want this Bill Gates to be publicly have his dingus chopped off if possible for his insolence. He vile hick charlatan who grew up in podunk Seattle and is sexually just disgusting and tasteless beyond all imagination dares to tamper with my Sexuality. He ought to be severely beaten to a pulp in public and have his dingus chopped off with network television broadcasting.

5. Problem I.1

Let $K(x,y)$ be a bounded measurable function on

$$\{(x,y) : 0 \leq y \leq x \leq 1\} \leq [0,1]^2$$

Let

$$Tf(x) = \int_0^x K(x,y)f(y)dy$$

Prove that T defines a bounded continuous operator in $L(L^p[0,1], L^p[0,1])$. Prove that spectrum of f is $\{0\}$.

5.1. **Meandering Path.** Let's see how we can get an L^p boundedness.

You see, before we do this, I want to tell you about something that always gets me confused.

Suppose $a_1, \dots, a_N$ are real numbers. Consider for $1 < p < \infty$ and

$$(|a_1 + \cdots + a_N|)^p \leq (|a_1| + \cdots + |a_N|)^p$$

So that's fine. But if you are sloppy you will mess up a *constant* because it is not true that

$$(|a_1| + \cdots + |a_N|)^p \leq |a_1|^p + \cdots |a_N|^p.$$

What is true is that there is another constant $C(p) = 2^{p-1}$ that you can get that bounds all the mixed terms with $|a_j|^p$. This is Minkowski's inequality and I just looked at Wikipedia for a proof. See it is good to have some clarity. Then we apply this thing in this case

$$|Tf(x)| \leq 2^{p-1} \int_0^x |K(x,y)|^p |f(y)|^p dy$$

Now we can use the bound on K, say

$$|K(x,y)| \leq B$$

Then

$$|Tf(x)|^p \leq 2^{p-1} B \int_0^x |f(y)|^p dy \leq 2^{p-1} B \|f\|_p^p$$

Then we integrate on $[0,1]$ and get

$$\|Tf\|_p^p \leq 2^{p-1} B \|f\|_p^p$$

Now consider

$$(z - T)f(x)$$

for various $z \in \mathbf{C}$. Our goal is to prove something about invertibility of the operator when $z \neq 0$.

The method I had devised was not as satisfactory as I would have liked. It was based on the fact that $Tf(0) = 0$ always and then doing some analysis along $0 \leq x \leq 1$ and producing approximate inverses.

5.2. **Search For Inversion Of Volterra Operators.** Before we attempt a purely 'real variable' inversion of Volterra operators let us just relax and explore a little bit. It is January 29 1:04 PM in Allen Texas. My sleep has been horribly damaged for more than a year since Bill Gates had begun his invasion into my personal meta with all manner of racial slurs every two seconds, and I have to face local mental health workers' convictions that actual harm to my life by one of the most malevolent horrible lowlife menial stupid retarded moronic disgusting evil criminal sons of bitches this human race has ever produced, this vile *Bill Gates* is 'hallucinatory'. So be it. I still have to make sense of Analysis and it's role in fundamental physics. And the sun is bright around here, and it is chilly a bit. My sleep was horrible, as Bill Gates put so much power to harm me that any Bengali Man would have perished by November 4 2020, but I survived. And so let us relax and explore a bit here.

Let's make the simplifying assumption that $K(x,y) = k_1(x)k_2(y)$. This is most certainly not useful generally because most interesting integral kernels will mix up x and y in complicated ways. We are attempting here to look at the situation in different ways for insight before rushing into 'real variable' methods with its chopping and slicing and dissecting sets.

Suppose $z \in \mathbf{C}$ is nonzero. Invertibility is being sought for $(z - T)$ so we take an arbitrary $g \in L^p[0,1]$ and attempt to solve the equation

$$zf(x) - \int_0^x K(x,y)f(y) = g(x)$$

You have to understand something dear reader. I am keenly interested in Natural Philosophy of eighteenth century, the Enlightenment era, and the evolution of philosophy of Science. I am more interested in that than in finding all sorts of Mickey Mouse results on technical matters. But let us give Vito Volterra his due. He was a great mathematician, and he was Italian. Thank God for Italy. I love Hugo Boss for some fashion. While America does have some good things, I am bitterly horrifically unimpressed with this disgusting vile tasteless Bill Gates and he is surely a permanent mark against American Civilisation. The only hope America has is myself. So long as I am still in America, great taste and cultivation shall still be possible in this land which will sink into barbarism totally without me.

Let's make our assumption and obtain

$$(z - k_1(x)) \int_0^x f'(y) - k_2(y)f(y)dy = g(x)$$

I see some light here in this simple case.

$$d/dx \left(\frac{g(x)}{z - k_1(x)} \right) = f'(x) - k_2(x)f(x)$$

In this case we introduce integrating factor

$$I(x) = \int_0^x k_2(s)ds$$

and let

$$G(x) = \frac{g(x)}{z - k_1(x)}$$

and note

$$\frac{d}{dx}(e^{I(x)}f(x)) = e^{I(x)}G(x)$$

This can be integrated on both sides and we can recover $f(x) - f(0)$.

The reasoning here shows that if $K(x,y) = k_1(x)k_2(y)$ with k_1, k_2 both integrable, and f is assumed to be C^1 then we can solve

$$(z - T)f = g$$

and assuming uniqueness, the solution is C^1 etc.

I love this. This has a certain classical analysis feel to it, and employs integrating factors. I have actually used a lot of integrating factors to show stability of deterministic multiparticle atoms and molecules fruitfully in four-sphere theory. For this reason I am not so dismissive about elementary differential equations techniques.

That's really nice. We have some way of solving the equation by reasonable steps in the separable case.

Now can we use the separable case fruitfully for the more general case? Now the real varible methods are generally powerful in non-constructive ways.

5.3. **Émile Picard Iterations.** Even F. Riesz and Sz-Nagy repeat the nomenclature 'method of successive iterations' to the Émile Picard's iteration scheme. Let's see if we could use it for Volterra equations.

$$zf(x) = g(x) + Tf(x)$$

Let's rewrite this as

$$f(x) = g(x)/z + (T/z)f(x)$$

The iteration scheme would be

$$f_{n+1}(x) = g(x)/z + Tf_n(x)/z$$

This might be a reasonable way to do this, since we have boundedness for T in $L^p[0,1]$. Wait

$$\frac{1}{z-T} = \frac{1}{z}(\sum_{j=0}^{\infty}(T/z)^k)$$

This ensures that spectrum is contained in a ball $|z| < \|T\|$. Well that's not strong enough to get us invertibility for all $z \neq 0$ but it eliminates most of $\mathbf{C}$. In this problem we do need to use Volterra form to eliminate spectrum in the region $|z| < \|T\|$ where we can't just use the Neumann series reliably.

5.4. **Solvability Of Volterra Equations.** We are still on our quest to prove solvability of equations, for $|z| > 0$ of

$$zf(x) - Tf(x) = g(x) \tag{1}$$

What we discovered in the last subsection is that it is foolhardy to seek iterative schemes in the Neumann series. We must find another route, and the next route we shall explore is one where we consider N a large number and cut up the x axis in N equal parts. Let us label this partition of $[0,1]$ by $x_0, \ldots, x_N$ with

$$x_k = \frac{k}{N}$$

We take a relaxed general view and expect that an iterative scheme might work for solving our equation. Incidentally, over the years, I have noticed that in Analysis, because the field is so vast that it is valuable to take a broad view on problems. More often than in other Mathematical fields such as Algebraic Geometry and others, in Analysis, there is no guarantee that problems will have any resolution at all within any axiomatic context at all.

Now in this case, this is a Stanford Ph.D. Qual problem, and we know the answer, which is that (1) is definitely solvable. In other situations, no one knows a damn thing about the situation at all, there are no published papers, no guidance and one is left with a situation that is not only unknown but even worse, *no one gives a damn about your interest in the situation either.* All your appeals to the experts in all fields with be met with deathly silence and total lack of interest. And that is when you have to face the truth, that when you think a situation might have value, you have to do your own exploration, without the accolades of the crowds. No throngs of lovely maidens will greet you as great intrepid explorer, the Odysseus returning from his great adventures. And what is worse, I can show you my birth marks that would allow Penelope to recognise me as the great hero but all to no avail. The ancient customs are lost forever, and so it is important to have some self-reliance. Fickle is the interest of the throngs of devotees.

Fine, I do not have a good singing voice, so there is a significant disadvantage to rock stars. I almost was beaten up for singing Radiohead's *Nude* and Elton John's *Tiny Dancer* while mildly high on pretty good quality marijuana on Valencia Street several years ago. As you can imagine with these various experiences, I have grown wiser with the years.

So let us consider the closed intervals $J_k = [x_{k-1}, x_k]$ for $k = 1, \dots, N$. We have a fixed $g \in L^p[0,1]$, a fixed $z \in \mathbf{C}$ with $|z| > 1$ and we are interested in solving (1). We are chatting while we think about what to do here. We are most pleased that the sun is up and the birds are singing in Allen Texas.

We want to start at the beginning, i.e. J_1. What happens when N is so high that g is constant $g(0)$? If it's zero we set $f(x) = 0$ on J_1. Otherwise we solve

$$zf(x) - Tf(x) = g(0)$$

on J_1. We know here $|Tf|$ is very small because $Tf(0) = 0$. We ought to set

$$f(0) = g(0)/z$$

The idea is now to consider the integral

$$Tf(x) = \sum_{k=1}^{N} = \int_{J_k} K(x,y)f(y)dy$$

and consider $g(x_k)$ for $k = 1, \dots, N$ and build up the solution $f(x)$ in sequence.

Now that we made small progress in our goal, regardless of how small it is, we immediately congratulate ourselves because we made progress. This is extremely important. When faced with a situation you are dealing with and no one has interest in it. I know from experience that when I overthrew all of Big Bang Theory and Gravity and Relativity and Quantum Mechanics and Quantum Field Theory even though it was obviously very important, and I had success, the response was deathly silence. You have to immunise yourself from the expectation that people care. People do not care. They only care about their own totally irrelevant Mickey Mouse issues.

5.5. **Important Elements of Greatness.** The first thing one should understand about greatness is that *no one else in the entire world is obligated to confer greatness to you and it is your own responsibility to understand this.* Therefore, being mathematically oriented, you have to have strong confidence that you can verify when you are right and when you are wrong. I cannot emphasize enough how central this is for greatness. Never expect anyone else to tell you if you are right or wrong. They will never even put in the effort to check and suddenly become too busy for you *when the stakes are high.* For this reason you should expend a huge amount of effort to ensure that you can verify when you are right and when you are wrong. Those who have not expended the effort to assess themselves if they are right or wrong because they believe that some experts somewhere will do it are out of luck and will *never be great at all.* This is because greatness is not dependent on what experts think. It is based on what is truth. And without ability to know when you are right and when you are wrong totally independently of anyone else, you forever cripple yourself and even if you have potential to be great will never be great.

I know that I have succeeded in overthrowing Quantum Mechanics and Gravity and General and Special Relativity because I spent the time to learn how to assess my own work totally by independent effort. This holds true for all fields of effort. Before anything else, learn to assess whether things are right, wrong, good or bad. Then assess your own work. It does not matter what anyone else thinks. Assessment of your own work is basic to any progress. Do not accept anyone else's assessment at all regardless of how many Nobel Prizes they have. Those are not fundamental. I know I am an immortal genius because I succeeded by criteria of scientific theories that are objective, and not because I was given any accolades for four-sphere theory.

This problem of solving a Volterra Equation is today just an exercise. But here I am taking the opportunity to show the reader how to make progress on a problem. For example, it is clear to me totally that I have not produced a valid solution yet. That sense of knowing that you have not produced a valid solution to a problem is crucial for greatness. Your own instincts and skills must be able to do this. Never ever rely on expert opinion to tell you whether you have solved a problem or not. That is totally suicidal for any intellectual work at all. You must know yourself. People have a million motivations to deny credit. The entire field of Cosmology has to deal with non-existence of gravity, ergo of black holes and big bang and expansion being fantasies. They have vested interests in denying my achievements. But that changes nothing. I am *right* and my work will stand the test of time. And I know that with 100% confidence. And that is crucial here.

6. Straightforward Warning To Cosmologists

My prediction of redshift slope is not just a little bit but *infinitely* more robust than the wild fantasies of Edwin Hubble and Georg Lemaitre and Alexander Friedmann. My explanation of redshift that is based on a static four-sphere universe is infinitely stronger science than anything dreamt of by the philosophy of Alexander Friedmann. Be careful before you collapse your entire field by foolish attempts to challenge my four-sphere theory. My numbers are infinitely better than the ones that established your fantasies.

6.1. **The "Markovian" approach To Volterra Equations.** We have set up the problem of solving (1) and what we want to do next is a small step. We want to see x like time, rather than a space variable. We want to then solve the equation in an early region $(0, \delta)$ and then use the solution $f(x)$ for $0 < x < \delta$ as input for $x > \delta$.

Suppose we have solved (1) for $x \in [0, delta]$. We have fully accounted for $g(x)$ then for $x \in [0, \delta]$. The point here is that the quantity

$$\int_0^\delta K(\delta, y) f(y) dy$$

uses some known quantity $f(y)$ for $0 \leq y \leq \delta$. Then we look at

$$zf(\delta + h) - \int_0^\delta K(\delta + h, y) f(y) dy - \int_\delta^{\delta + h} K(delta + h, y) f(y) dy = g(\delta + h)$$

Rearrange this a bit

$$zf(\delta+h) - \int_{\delta}^{\delta+h} K(\delta+h,y)f(y)dy = g(\delta+h) + \int_0^{\delta} K(\delta+h,y)f(y)dy$$

This would give us

$$f(\delta+h) + \int_{\delta}^{\delta+h} K(\delta+h,y)f(y)dy = \frac{1}{z}(g(\delta+h)+A)$$

where A is some fixed quantity since we assumed that $f(x)$ for $0 \leq x \leq \delta$ is known. So what we are seeing here is that

$$\frac{g(\delta+h)+A}{z}$$

is close to the right answer for $f(\delta+h)$, the unknown and we have a term

$$\int_{\delta}^{\delta+h} K(\delta+h,y)f(y)dy$$

that needs to accounted.

In some sense, this is the same situation we had in the first step of $J_1 = [x_0, x_1]$. We don't have an answer to the problem yet, but we are beginning to see some analytical insight at this point.

7. Constantin Caratheodory's Existence And Uniqueness

When I was young, I was quite sharp about calculus problems. In John Adams High School, I took Calculus BC Advanced Placement course and obtained a 5 in 1988, sophomore year. I was also good at Physics C and obtained a 5 as well the same year. Many people at Princeton had those sorts of results and one problem is that when you are able to do well on one level of Mathematics, there is often a tendency not to appreciate how difficult problems can be.

This problem is not so difficult in the end but after an entire day of exploration, I suddenly realise that I can use the Constantin Caratheodory Existence and Uniqueness Theorem for solving first order differential equations in this problem. I differentiate both sides, and obtain

$$zf'(x) - K(x,x)f(x) = g'(x)$$

with initial condition $f(0) = g(0)/z$ and just obtain solution to the equation by an appeal to Caratheodory Existence Theorem for $0 \leq x \leq 1$. I won't go into all the various conditions for the existence theorem.

This ensures if $|z| > 0$ then z is in the resolvent set of T.

Now that's quite a sophisticated bit of Analysis. But this is a serious solution because I know Caratheodory's Theorem is solid and that's all I really need for certainty here of a solution.

But you, my dear readers are rather skeptical. You say, well, you took a derivative of an $L^p[0,1]$ function to the right. I'll tell you what. I will solve the equation for all $C^1[0,1]$ functions, then use continuity of resolvent to get the rest of $g \in L^p[0,1]$. This is a serious solution. I am not Bill Gates selling snake oil for a lot of money. I am a serious Virtuous honest man with serious purpose.

8. Problem I.2

We are given $0 < \alpha < 1$ fixed and asked to find a continuous function $f : [0,1] \to \mathbf{R}$ with the property that for every fixed $\delta > 0$ and every fixed $C > 0$ and every $x \in [0,1]$ there is a $y \in (x - \delta, x + \delta)$ with

$$|f(x) - f(y)| > C|x - y|^\alpha$$

8.1. **Ruminations On Bad Functions.**

At some point we will be examining this problem with effort to solve it. But that does not interest me so much immediately. Instead, I will get distracted. I am Asian-American, and there is something about Asian men that when we get older – I am 49 now – we are rather distracted by all sorts of things that are not as interesting to young ambitious men. And women too, I surmise, but I am a man, and quite heterosexual too in my view of the world. And over the years, I got sick and tired of all the talk of men and women and decided this. If I am a heterosexual man from November 19 1973, and do not have special powers to see the world from the perspective of either women or that of gay men or bisexual men, what is the point of pretending that I have *any idea whatsoever* of how these people who are not me, sees the world. My universe is seen from the perspective of a heterosexual man, and it is perfectly complete and sensible from this viewpoint. And that's the only viewpoint I have, with absolutely no interest in examining whether deep inside I am any other way. People who pass their puberty and are confused about what sort of thing sexually interests them – I really don't know what to say about them. I was a healthy heterosexual man from my teenage years without any confusion whatever about my sexual interests. In fact although it is not considered so politically acceptable in this age, I look at my body and sexual organs and look at the biology of the human species, and I can connect the dots quite clearly and deduce that if I am sexually attracted to females who might provide progeny, I am a healthy human male. Heterosexuality does not require any defense in the human species. People have been fathers and grandfathers, husbands and lovers for tens of millions of years and I feel just quite well-adjusted with my 'heterosexual prejudices'. All sorts of confusions about one's own sexuality, they never occurred to me. You can call me a simple man, if you will, but I am quite deeply tied to the naturalistic view that it's pretty damn normal to be heterosexual male among the land of human beings.

Now about this problem. You see when Leonhard Euler first wrote down the definition of a function, he did not consider real-values depending on others, the definition of function I learned during high school. I was pleased with the $f : X \to Y$ notation because suddenly it was a miraculous evolution of my intellectual life as I noticed that all the people who do not use this in their daily lives are not really *serious* thinkers about material. Those are the people who ruined the world buying Microsoft Excel, mind you. In a perfect world, no one would buy these horrible software like Spreadsheets. They degenerated human intellect.

When was it that Leonhard Euler defined a function? *Introductio in Analysin Infinitorum* of 1748. Hans Niels Jahnke is my guide here, and tells us clearly that Leonhard Euler's first definition was inherited from Johann Bernoulli from 1698 as "functions of the ordinates" and it was Johann Bernoulli who defined function formally for the first time in 1718. Euler in 1948 used this definition.

> A function of a variable quantity is an *analytic expression* composed in any way whatsoever of the variable quantity and numbers or constant quantities.

It is valuable to put things in perspective. Problem I.2 is asking us to do something that was literally beyond the imagination of Leonhard Euler in 1748. The entire universe, all of humanity, had no idea then that one day, ordinary innocent Stanford Mathematics Graduate students would be subjected to horrors that were not even conceived in 1748. That's not very long ago, 274 years. So there's some development in the notion of function. Time passes, time passes, and suddenly we have the German mathematician Peter Gustav Lejeune Dirichlet who had abandoned his fatherland to move to Paris. He timidly addresses some issues of discontinuous functions in his secret writings.

Let me fast-forward to young Zulfikar Moinuddin Ahmed's first encounter with these things. I did do something with these at Princeton, but it was afterward at Lehman Brothers when I began looking at measurement data of prices in Capital Markets. I was not actually aware of the work of Louis Bachelier who introduced Brownian motion for the purpose of modeling price fluctuations. This is something Mathematicians do not truly grasp. We call the process Brownian motion, but Brown did not model any of this process. Why is this called 'Brownian Motion'? Then we call it Wiener Process.

I will submit that the Gaussian process ought to be called Bachelier Process and not Wiener Process or Brownian Motion. I fail to understand why people are so disrespectful of original contributions. Louis Bachelier had a larger impact on the world than Norbert Wiener did quite clearly. It ought to be called Bachelier Process, not Brownian Motion or Wiener Process. It's infuriating.

Anyway, so I learned that Brownian paths have $\alpha = 1/2$ Hölder Continuity. Rather I should say, *Bachelier paths* have this property. I am just incensed. When did people modeling pollen movement in liquids originate the thing that we call Brownian Motion? It was Louis Bachelier who actually introduced it and he did not get to have his name plastered all over the world when all of global finance had been using his process and we have to call it names of all sorts of people whose contributions were both later and not as original?

8.2. **Zulf Does Not Understand Why I Have To Do Everything Around Here.** Why can't people give credit to people who do immortal genius work properly around here. People give credit to Cauchy for continuity when Bolzano invented it. People give credit to Newton-Raphson when Thompson did the algorithm for root finding. People give credit to the botanist Brown when the process was due to Louis Bachelier. Why can't people give credit to people who deserve credit instead of constantly lying about things in this planet? This is just intolerable. Why do I have to fix everything around here. You don't have any honour? You don't have any shame? How could you do this to Louis Bachelier? He is the first to produce the Gaussian model that is the central model of all of stochastic process theory and you just screw over the man and shamelessly call it "Brownian Motion" and fill up journals and books with it? That is just disgusting.

I am older now and my concerns are for my own immortality for the sacrifices I have made to establish four-sphere theory. I simply cannot stand the barbarism of the Western Academia where everyone's work is put in a lottery and totally random people are given credit by herds of people without any concern for who was responsible for what. This barbaric lawless Hobbesian way of proceeding will not lead to any illumination at all. Louis Bachelier was mistreated in France and despite his spectacular work he did not even have an academic job in France. It's just atrocious. Actual construction of what is called the Brownian Motion is 100% his innovation and not of Robert Brown at all. Why did the object get called Brownian Motion in the first place? It is positively disgusting and disgracful what has happened in this case.

8.3. **The Stochastic Process View Of Problem I.2.** Without any nitty gritty, the smooth way of doing Problem I.2 would be consider how to produce the function $f : [0, 1] \to \mathbf{R}$ as the *sample path of some continuous stochastic process*. Let's just assume we know that the sample path of a *Bachelier Process* will have Hölder continuity $\alpha = 1/2$. this will then not be rough enough to solve the problem.

8.4. **Barebones Approach.** Let us attempt a barebones construction for a simpler problem. Suppose that instead of Problem I.2 we have a simpler problem. We start with a fixed $C > 0$ and $\delta > 0$. This ought to be easier than the problem we are given. The goal is to find $f_{C,\delta}$ that is continous on $[0, 1]$ but the variation is such that δ-neighborhoods of every $x \in [0, 1]$ contains points y with $|f_{C,\delta}(x) - f_{C,\delta}(y)| > C|x - y|^\alpha$ for all $0 < \alpha < 1$.

For this purpose we just pick $N > 1/\delta$ and just start with $f_{C,\delta}(k/N) = 0$. Now we take a α_k with $\alpha_k \to 0$. Then we take countable points $2^{-n}q/N$ and just set

$$f_{C,\delta}(k/N + 2^{-n}q/N) = (C + 1)(2^{-n}q/N)^{\alpha_n}$$

Then we just interpolate by affine lines to ensure $f_{C,\delta}$ is continuous.

8.5. **Parametrizing of C, δ.** Intuitively this problem is about squeezing a lot of variation into small intervals with countable points but with various families using this 2^{-n} trick. This can be done with some more families and interpolation will take care of continuity in the end. This problem is not so bad with some care. So I will consider this solvable and move on for now.

My stochastic process sample path idea is more significant because there is more mathematical substance in that direction. The trouble is that the *homogeneity* assumption of Lévy processes lead to their continuous components being the *Bachelier Process*. Yes, I have decided to abandon *Wiener Process* and *Brownian Motion* and call the thing *Bachelier Process*. I don't give a damn if people do not understand what I mean. My Conscience is more important than people's convenience.

9. A Good Solid 10 Minute Harder Win January 29 2022

Starcraft II is a game I play to just gain some clarity on my mind and keep track of how *habituation* improves skill over time. I am reasonably good against 'Harder' AI. I just played a solid 10 minute win against Harder AI and took a break between Problem I.2 and I.3. I thought I would publish the game [5].

10. Message To United States Government

Bill Gates has invaded my personal finance meta, destroyed my Ancestral Indian Aristocratic Meta, invaded my Sexual Meta attempted to destroy my seed claiming that he has 'white rights' to do this. If United States Government does not resolve this situation, I will go on a campaign to Nuclear Holocaust the entire United States Landmass with extreme enthusiasm from 4.5 billion Asians who are all sick and tired of American White people's Genocidal tendencies from the genocide of Native Americans. Stanford University can you please relay this to senior United States Government officials. Enough is enough. American White People have caused more death and destruction to Asians from Hiroshima and Nagasaki, Korean War, Vietnam War, Iraq and Afghanistan Wars and I am American. You want a grave Nuclear Holocaust Scenario, keep not securing my American Natural Rights. Otherwise you better hope that your defenses can handle a million nuclear ballistic missiles incinerating the entire American Continent, capisce? Totally incompetent worthless fucks.

11. Problem I.3

Suppose $K \subset \mathbf{R}^n$ is compact and $f \in C^\infty(\mathbf{R}^n)$. Show that if the differential of f does not vanish on K then for all $u \in C^\infty(\mathbf{R}^n)$ with support in K and all $N > 0$ there exists a C such that

$$|\int e^{i\xi f(x)} u(x) dx| \leq C xi^{-N}$$

for $\xi > 1$.

We consider the two term Taylor expansion with some $x_0 \in K$,

$$f(x) = f(x_0) + \langle \nabla f(x_0), x - x_0 \rangle + O(|x - x_0|^2)$$

Then we just pull out the $f(x_0)$ an $O(|x - x_0|^2)$ terms

$$|\int e^{i\xi f(x)} u(x) dx| \leq |\int e^{i\xi \langle \nabla f(x_0), x - x_0 \rangle} u(x) dx|$$

This is close to a Fourier transform and we could invoke a theorem here about decay of Fourier transforms or we could try to prove the decay directly.

12. Fourier Transform Of Schwartz Functions Are Schwartz

You see, $u \in C^\infty(\mathbf{R}^n)$ with support in K is Schartz. Now Fourier transforms of Schwartz functions are Schwartz. This is such a standard result that all Analysts know this. The decay of Schwartz functions imply the result sought in Problem I.3 by a little bit of manipulation where the Fourier variable $y = \xi \nabla f(x_0)$ and we get rid of the $\langle \nabla f(x_0), x_0 \rangle$ too absorbing it into the absolute value. Then we would get a bound with $C(1 + |y|)^{-N}$ easily from Schwartz condition.

Why should I embarrass myself and make some error and not recover that Fourier transform of Schwartz functions are Schwartz? It's better to leave it at that and quote the standard result and move on.

13. Problem I.4

Show that Schwartz functions $\mathcal{S}(\mathbf{R})$ with seminorms

$$\rho_{k,\ell}(\phi) = \sup |x^\ell \partial^(k) \phi|$$

is not a normed space.

Constants are killed by $\partial^{(1)}$ so the seminorms do not have have the property that $\rho_{k,\ell}(\phi) = 0$ implies $\phi = 0$. The seminorms are defined for non-negative integers so zero is included.

I will have to admit that I do not know without further thought how to prove that there is no norm that would work. This is a serious matter because the whole technical mumbo-jumbo of seminorms would not have been invented if spaces like this were normed in the first place.

My strategy is to chit-chat and keep the audience occupied with the diabolical plan of *looking up Reed-Simon Volume I* for the right answer.

You see, I will be blunt. Jon Von Neumann was involved in this locally convex business with seminorm topologies and weak convergence in Horlicks spaces with a other beverages, and whenever Von Neumann was being clever, Zulf is wise and *looks things up*. At 49 I have no intention of trying re-invent anything Von Neumann did in his life. The man was on a mission to befuddle the entire world with arcane topologies and every manner of technical mumbo-jumbo imaginable.

Fine You see Reed-Simon is what I used in 1992-3 at Princeton and with this technical mumbo-jumbo, I know that I will never know if there is an error. I am quite Ralph Waldo Emersonian in my self-reliance and self-trust. With this self-reliance comes the basic instinct to value texts and people *who do not make technical errors* and Barry Simon is very conscientious and Reed-Simon has been proofread for many decades. So those are reasons to trust it.

You see, seminorm topologies and weak topologies on locally convex topological vector spaces and these things are totally technical mumbo-jumbo to me. It's like the wiring in the iPhones or machine code or Intel Core i7 architecture. You're glad that someone is getting paid to do those things so *you don't have to*. My life is far too short and valuable for me to delve into (a) chip design, (b) writing low level C device drivers, (c) dealing with technicalities of seminorm topologies. These are not pleasant for me, and I don't enjoy them, and I have better things to do to contribute to society. I don't think they are worth my time. I do care about broad understanding of Mathematics but this is wiring for me.

13.1. **Examination Of Neighborhood basis.** We use the nonstandard notation $\alpha = (k, \ell)$ for convenience. The neighborhood basis of zero are

$$N(\alpha_1, \ldots, \alpha_N; \epsilon_1, \ldots, \epsilon_N) = \{\phi \in \mathcal{S} : rho_{\alpha_j} \leq \epsilon_j\}$$

and we consider whether these are comparable to norm-balls. The seminorm topology is defined with finite number of seminorms in the neighborhood bases.

If there this topology were generated by a norm $\|\cdot\|_{exotic}$, then we would have

$$\|\phi\|_{exotic} \leq C \sum_{j=1}^{N} \rho_{\alpha_j}(\phi)$$

Then with finite number of vanishing $\rho_\alpha(\phi)$ we can guarantee $\|\phi\|_{exotic} = 0$ and that does not happen whenever the finite set contains any $\alpha_j = (k_j, \ell_j)$ with $k_j \geq 1$.

I do not know how to produce a solid proof though.

13.2. **Quite Confusing.** So why is a fixed $\rho_{k,\ell}$ not a norm on $\mathcal{S}(\mathbf{R})$?

If $\rho_{k,\ell}(\phi) = 0$ then we have for every $x \in \mathbf{R}$ that $\phi^{(k)}(x) = 0$ so $\phi(x)$ is a polynomial of degree at most $k-1$ but since $\phi \in \mathcal{S}(\mathbf{R})$ it vanishes at infinity so $\phi = 0$.

What is the problem with this? Some man looks like he got a homework problem with this exercise.

See [6].

14. Fine Points Of Difference Between My Religious Faith And Doctrines Of Christianity, Judaism And Islam

Between 1979-2008 I was indeed Atheist even though my family was Muslim. But then I had found my own faith. I believe I have been an Archangel of Heaven for billions of years before my birth. God exists as a force that moves all things of Nature. But I also believe that in the billions of years, God has always been silent and mysterious and never gave any messages to Archangels of Heaven including myself.

This differs in essential aspects from Christian, Jewish and Islamic Doctrines. Central to my faith is the eternal silence and inscrutibility of God. Furthermore I believe that the universe has existed for infinite time in the past and had no moment of Creation. Those things ensure that although I do love my beloved people the Human Race, I cannot quite join in on the major religions.

15. Virtues And Character Strengths In My Theology And In My Science

Let me assure you that anyone who is serious about the Science of Human Nature, as I have been for some years now will find a great deal of merit in Virtue as an aspect of Human Nature. I have empirical results to support my views. First, I discovered that there is empirical measured varibles that validate the scientific theory that Universal Human Moral Nature is primarily driven by species level genetic evolution. The support is from World Values Survey where for Moral Values I have found global (geographical global, not mathematical global) regularities and uniformities. These you can find in [1]. Second I have verified that for non-mating or non-sexual moral values, Aristotle's Virtue-Eudaimonia theory is valid. People with higher moral values have higher *Life Satisfaction*. In fact I have examined the great genius of Avicenna who had theorised reality for Romantic love before his death in 1037 and extended Aristotle's theory to include Virtues associated with Romantic Love and actually identified them from empirical research.

Thus Virtues are significant and objective issues for Human Nature. They are not mere speculative theories. Theologically Virtues are important for me as well for I consider Virtues to be Angelic; I also see the Human Race, based on my work on Universal Human Moral Nature as an Angelic Race. I would like tenure from Stanford University partly to implement some Quantitative Positive Psychology at eight billion people level.

Bill Gates is getting in my way, and I would like the little twit beaten back and possibly hurl him back to his origins, Inferno. The little vile criminal scrub deserves to be beaten with all his bones broken and burned to cinders consumed by fire.

16. Problem II.5

Suppose a_n is any sequence of real numbers. Show that there is a $f \in C^\infty(\mathbf{R})$ with $f^{(n)}(0) = a_n$.

We'll follow the hint. Let $\chi \in C^\infty(\mathbf{R})$ be defined by

$$\chi_(x) = \begin{cases} 1 & |x| \leq 1 \\ 0 & |x| \geq 2 \\ e^{1-\frac{1}{2-|x|}} & 1 \leq |x| \leq 2 \end{cases}$$

Let

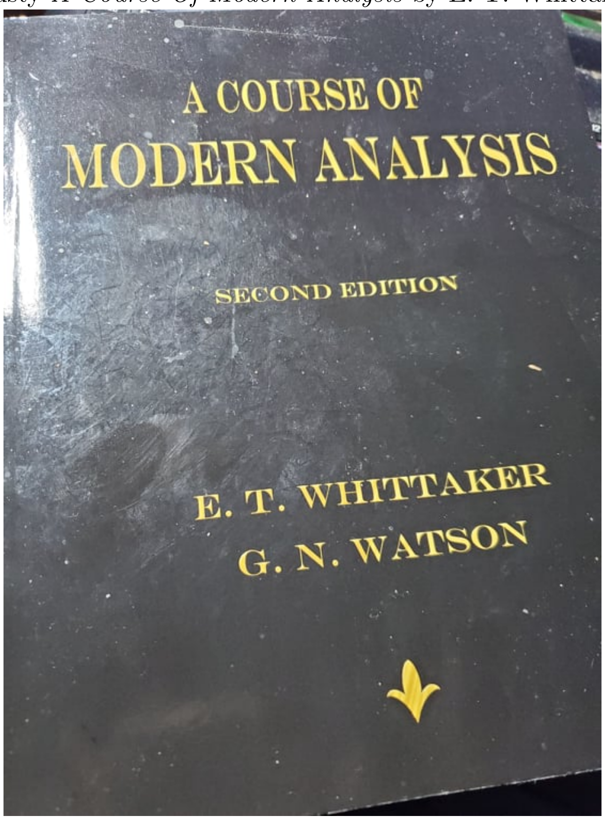
$$f_N(x) = \sum_{n=0}^{N} a_n \chi(x/epsilon_n) \frac{x^n}{n!}$$

All we have to do in this case is ensure that the radius of convergence of this series is 1. It's clear that so long as $\epsilon_n > 0$ we have

$$f_N^{(n)}(0) = a_n$$

The Stanford Ph.D. Qual Directors have given a situation where the only content that needs to be added here is careful use of radius of convergence.

Now since I am remarkably lazy, and don't think there is any other mathematical issues of interest here besides considerations of radius of convergence, I turn to my trusty *A Course Of Modern Analysis* by E. T. Whittaker and G. N. Watson.



I love this book because no one in the world has produced so much expertise on convergence of series as these gentlemen, and I love the style of 1908 England. By the way E. T. Whittaker is also famous for his extremely serious history of electromagnetism.

I have found, my dear readers, that showing good taste in your reading material has much more value than just impressing lovely ladies. It has intrinsic value, for a cultivated man of good taste is the product of entire Civilisations.

16.1. **Weierstrass and Hardy Tests Of Uniform Convergence.** The Weierstrass Test for uniform convergence is to get a series of numbers known to be convergent to dominate the terms. The Hardy Test is more interesting. It says that if

$$|\sum_n d_n| < b$$

and f_n are decreasing then

$$\sum_n d_n f_n$$

is uniformly convergent. These are in pp. 49–51 or Whittaker and Watson. This is so exciting. We can now use some of these here.

Let's see. Let's see. First let's try

$$\epsilon_n = 2|a_n|^{1/n}$$

This will lead to

$$a_n x^n/n! = 0$$

for

$$|x| > 1/2|a_n|^{-1/n}$$

Then we have

$$\sum_{n=1}^{N} |a_n||x|^n/n!\chi(x/\epsilon_n) \leq \sum 2^{-n}/n!$$

This will have uniform convergence as $N \to \infty$ so we have a continuous function in the limit since the convergence is of a sequence of continuous functions.

That is very good. We would like to know that we are doing something to ensure the function is actually smooth and term-by-term differentiation is valid as well. That we will leave for later.

This is progress. We are bringing in Whittaker and Watson conditions to ensure that something reasonable happens. Note that the Problem II.5 does not lead to analytic functions because there we have to have uniform radius of convergence. This problem is designed to produce smooth functions only, so we are playing fast and loose with damaging the power series. The χ function is quite devastating to analyticity. However we can get uniform convergence for the functions themselves and ensure that differentiations are valid term by term many times. I have justified only a continuous limit thus far.

17. Zulf Records Deep Suspicions About This Supposedly Smooth Limit

You see, if you took arbitrary real a_n, even with distributions it would be difficult to justify

$$u(\phi) = \sum_{n=1}^{infinity} a_n \phi^{(n)}(0)$$

These objects are not bounded functionals on $C_0^\infty(\mathbf{R})$ and if they were we could consider convolutions to get a C^∞ approximation.

It seems extremely suspicious if you can just fiddle with cutoff functions to get a *smooth* limit. I showed following the hint of Stanford Ph.D. Qual Directors that there is a *continuous limit* but I am too fearful of the mess to even attempt to try to ensure that all the derivatives also have a uniform limit.

I mark this Problem II.5 as over-optimistic. Analysis is flexible, but I have never succeeded in walking on water for 49 years and this is far too miraculous.

Now you might be right, and I will be classified as one of the unbelievers like those who did not believe Jean Baptiste Joseph Fourier when he declared 'arbitrary' periodic functions have series expansions in 1811. But I have deep suspicions about managing to outwit all of Laurent Schwartz distribution theory just fiddling with a cutoff function and some parameters.

This is deeply suspicious claim, the Problem II.5.

17.1. Last Comment On This Problem.

The continuous limit of these

$$a_n x^n/n!\chi(x/\epsilon_n)$$

is compactly supported. It would be good to examine distributions on $\mathbf{T}$ to see if they allow arbitrary a_n which seems unlikely. Differentiation is pretty delicate and unlikely to retain smoothness because there won't be any uniform convergence of even the first derivatives so how will you be sure that the limit is smooth. In fact if you take derivative of the construction, suddenly you have no control of derivatives at zero and there is no convergence at all, let alone uniform convergence. I don't think the limit is even C^1.

This is not my comfort zone, so I won't comment further.

18. Problem II.4

This is one of the technical mumbo-jumbo issues of whether $L^1(\mathbf{T})$ is closed in the space of finite Borel measures when the topology is from duality with $C(\mathbf{T})$, and is not closed in the weak * topology. Then question is whether it is closed in weak topology.

The Banach space topology on $C(\mathbf{T})$ is with the sup-norm. Uniform convergence preserves continuity, so this is complete. Let us write $X = C(\mathbf{T})$ and $\mathcal{M} = X^*$. Let $Y = L^1(\mathbf{T})$. For $y \in Y$ we let

$$\langle x, y\rangle = \int x(t)y(t)dt$$

Let's make sure this makes sense. If $x \in X$ it is a continuous function with sup-norm bounded so we have

$$\langle x, y\rangle \leq \sup |x(t)| \|y\|_Y$$

and y defines a bounded linear functional with norm $\|y\|_Y = \|y\|_{L^1(\mathbf{T})}$. Suppose $y_n \in Y$ that converge in $\mathcal{M}$. Then for all $x \in X$ we have

$$\lim_n \langle x, y_n\rangle$$

defined. Let's say the limit is $\ell \in \mathcal{M}$. Its a finite Borel measure. The question is whether this is measure that has a density with respect to Lebesgue measure or Haar measure or whatever the standard measure is on $\mathbf{T}$.

What I do here is note that the family of linear operators $T_n = \langle \cdot, y_n\rangle$ satisfies

$$\sup_n |T_n x| \leq \|x\| \|y_n\|_Y < \infty$$

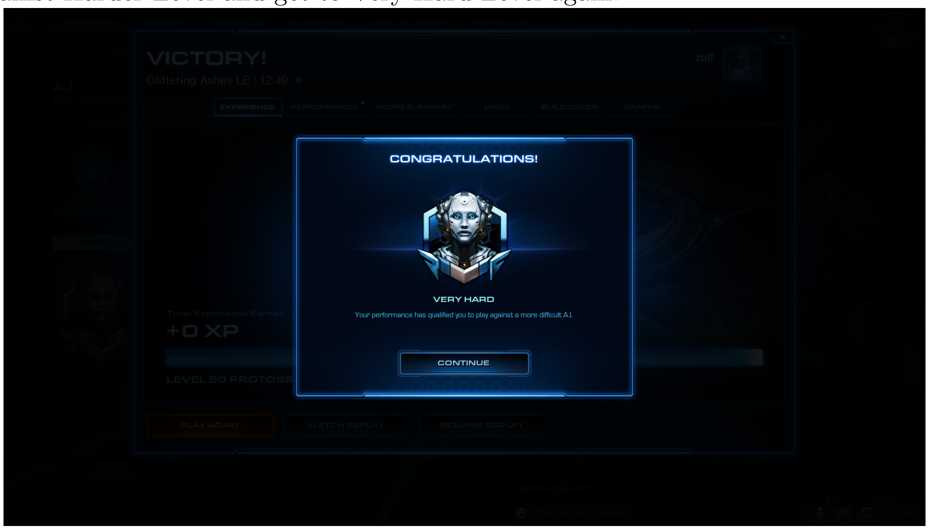
I am not used to this, so please be patient here. We use Banach-Steinhaus theorem to then get a uniform bound

$$\|y_n\|_Y \leq C$$

That's good. So we do have a bounded set in L^1. Now the next step is to examine whether y_n is Cauchy in Y. We know it's Cauchy in $\mathcal{M}$ and we want to know if it is Cauchy in Y.

19. A Starcraft II Harder Game To Very Hard January 30 2022

My form in Harder AI level has improved enough for me to win a good game against Harder Level and get to Very Hard Level again.



The game I archived here [7]. There is nothing interesting strategically in the game at all. It is part of my general experiment that mere habituation automatically increases skill levels.

For me the challenge is just keeping track of efficient production and I do not have the skills to pay much attention to the front-line engagements. I would not do well against other ranked players because they have micro-management skills and do not use AI approaches. But you will notice that my basic technique improves with practice. The body or psyche adjusts with familiarity and is smoother afterward because more and more things are without thought.

I believe this is true about many aspects of life, and even in Mathematics too. Habituation improves skill in ways that defy explanation. This is one of the reasons I spend time of Stanford Mathematics Ph.D. Quals problems. I find that that my intuition deepens with some practice.

Now in Mathematics I do have interest in history and philosophy of Science. Some things are more interesting than others. Four-Sphere Theory was work of immortal genius. I want full professorship from Stanford for that but I am willing to push a little bit and deepen my skills in Analysis. I believe that I ought to find equilibrium in a slightly higher plane of Mathematics in some months than the Stanford Ph.D. Quals level.

Now notice that I am an experienced Finance Quant and an experienced coder and an experienced Scientist. So I am not exactly any longer good candidate for Mathematics graduate of doctoral candidate. I am an independent Scientist with some great breakthroughs already. I am not directly interested in leading research in Mathematics at the moment. I have some other aims. But I do want Stanford to respond with a tenured full professorship as soon as possible.

20. Bill Gates Is Too Stupid To Understand What Immortal Genius Means

Bill Gates I am an immortal genius. This means that I will be remembered as a great genius for a million more years. You will die and rot before this changes. It is not for you to *decide* whether I am immortal genius. My work makes me an immortal genius. You are far too stupid to understand the concept. My immortality extends far past your lifetime, Bill Gates. There is nothing you can do to change it.

21. Strong Self-Promotion

I have pioneered the view that *human nature* consists of highly nontrivial functions of the *genetic code in common* or G_c common to all human beings and constitutes 99.9% of human genetic code for each person.

One deduction from this state of affairs is that we are at the infancy of understanding nontrivial human nature and here there is opportunities that have never been explored before to improve lives of eight billion of my beloved people the human race.

I have plans for Quantitative Positive Psychology development, a field that does not exist yet. I have experience in Quantitative Finance and eventually I expect that just as quantitative models have yielded fruit in Finance, so will Quant Positive Psychology – *eventually not soon* – yield fruit to improve Life Satisfaction and many other aspects of people's happiness and life globally.

I do have a pure jump Lévy Process Model for Human Moral Nature distributions but there is an infinitely open terrain that lies before us here and I want to push forward slowly in this arena. This is not extant social Science but something deeper and the role of Mathematics here is still murky.

I dislike ad hoc models and would rather develop organisations in Mission District San Francisco that takes a more relaxed systematic approach. I have the technology background to ensure affordable delivery to eight billion people. A cloud is a bad idea here. I need people to destroy Bill Gates blockade of $620 million owed to me by David E. Shaw and Christine Lagarde as that money is for these projects.

I am not phenomenally successful on these sorts of things, but I am a serious man with serious intentions here. I have spent more than a decade of my life in adverse circumstances pursuing four-sphere theory and I have had success. I ask that Stanford University and other respect this and other achievements and allow me some time perhaps even a decade before something of the class of IMF and World Bank in impact develop. These require zealous faith that these directions are worthwhile. I do not want situations where every month all sorts of people review things I am doing and cause headaches with funding and other problems. I need things done my way with maximal freedom to ensure livelihoods for talented people that are secure.

I will not be able to stomach me cajoling talented people to commit to my vision only to find themselves stranded in their career without salaries or other options. I ask that Stanford University respects this.

22. I Will Reveal My Political Strategy

My political strategy is very simple. You see Collins and Miller had a very nice paper that impressed me from 1994. The strong basic result is that *Self-Disclosure always leads to liking.* This is as true in politics as in dating and romance. It's human nature. I combined this with Aristotle's Theory of Rhetoric because I find convergence of my Eastern (Aristocratic) roots with my life as an Asian-American in classical thought where Vedic ideas, my natural tendencies match with Western *High Culture.*

Now America developed all sort of oddball hierarchies. I don't give much of a hoot about American special sauce. I trust classical theories of Character, Nobility and Reason, and I am an Aristocrat despite what level of wealth I possess. I don't look up to scrubs like Bill Gates *no matter how much wealth they possess* because I don't really care about American hierachies. In the end Character and Virtues and Nobility of the Soul determines true worth.

I do Self-Disclosure. I know Daniel Stroock personally but I don't need to know anyone else. I Self-Disclose without worry because I am comfortable with who I am. That's my strategy. It's Science. Self-Disclosure leads to liking. Rhetoric is the way to move crowds. And where I belong in the American Social Hierarchies is totally irrelevant. America is far too young to take it seriously. Today it's one thing. Tomorrow it's something else. It does not matter to me.

23. Problem II.3

Let $Mu = xu$ and Du the derivative as follows. Let $\mathcal{S}'(\mathbf{R})$ be the tempered distributions. Then $L^2 \subset \mathcal{S}'(\mathbf{R})$. Let

$$H = \{u \in L^2(\mathbf{R}) : Mu, Du \in L^2\}$$

Prove that H is a Hilbert space. Prove $\mathcal{S}(\mathbf{R})$ is dense in H. Prove the inclusion $j : H \to L^2$ is compact.

23.1. **A Very Good Problem.**

I first learned about Sobolev Spaces in the senior year at Princeton in 1995. It was in a class taught by John Morgan on Geometry of Four-Manifolds. I learned from work of Clifford Henry Taubes and Karen Uhlenbeck some of the delicate analysis for Yang-Mills fields on four-manifolds and these require Sobolev Spaces.

I am looking for tenure at Stanford University. As a result, although I do make a lot of complaints, especially when weak topologies of Horlicks Spaces and anything Jon Von Neumann does comes up, I do tend to make various comments to blow hot air up the Stanford Exam Director's ballooning egos to curry political favour with them.

Don't take this personally. As a matter of fact, realise that I am only really doing it because it's custom. You should really read a beautiful history book entitled *Galileo, Courtier* as I, being a Scientific Revolutionary do need to use similar strategies to establish my immortality.

This Problem II.3 is a very good problem. It is quite central to much of geometry. You see, this is the sort of problem that matters in Analysis. No one really cares about weak topologies of Horlicks Spaces or continuous extensions of multiplication being impossible to extend and all that jazz.

Sobolev Spaces are literally necessary to do any Analysis on the Space of connections on various principal G-bundles on a four-manifold. See, those are serious and central to Mathematics, because those are Civilised. They are Geometry. I mean they are Analysis in a way, but Analysis could introduce all manner of riffraff things. Things like Yang-Mills Fields on four-manifolds are different. They have a sheen of needing to exist, like the Castle of King Arthur or a Medieval Cathedral, central objects of Civilisation. Great monuments of Civilisation while some other things in Analysis really ought never have even been defined. They only exist to torment graduate students and other people who don't already have tenure at a good university. They belong somewhere, like the 14th Level of Dante's Inferno but there are grave questions about whether they belong on Earth.

23.2. **An Intuitive Division Of the Problem.** Suppose we take $R > 0$ fairly large. Our intuition is that H behaves like $L^2[-R, R]$ because $\|Mu\|_{L^2} < \infty$ literally eliminates the functions of $L^2(\mathbf{R})$ that are big outside $[-R, R]$.

We have time to meander, so let us define

$$H_R = \{u \in L^2[-R, R] : Du \in L^2[-R, R]\}$$

We claim that this is a Hilbert space with the norm

$$\|u\|_R = \|u\|_{L^2[-R,R]} + \|Du\|_{L^2[-R,R]}$$

and the inclusion $j_R : H_R \to L^2[-R, R]$ is compact.

Let us examine if this is right. If so, then we can consider the problem really about this feature of compact intervals and we then do not expect the same sort of compactness to hold on $L^2(\mathbf{R})$ without $\|Mu\| < \infty$.

In any case, the heart of the problem is this compactness property of the inclusion.

Suppose, then, that $\|u_n\|_R \leq B$. Now we want to point out that in the end the compactness will be due to the *Arzela-Ascoli* theorem which says that a sequence of continuous functions $f_n \in C[-R, R]$ has a subsequence that converges uniformly if they are *equicontinuous.*

Our task will be to find some way of using the *distributional derivative bounds*

$$\|Du_n\|_{L^2[-R,R]} \leq B$$

into some sort of equicontinuity for the family u_n and apply the Arzela-Ascoli theorem.

That's the nebulous vague plan here. Let us make progress towards this plan by assuming u_n are all $C^1[-R, R]$. We would like to say that if $\|Du_n\| \leq B$ then the family is equicontinuous.

Let's see.

$$u_n(x) - u_n(y) = u_n(x) - u_n(x + (y - x)) = -\partial u(x)(y - x) + O(|y - x|^2)$$

for any $x, y \in [-R, R]$ sufficiently close to each other. We don't have pointwise control in the problem. Let's do this instead, let $y \in [-R, R]$ be fixed, and consider $(y - \delta, y + \delta)$.

$$\int_{y-\delta}^{y+\delta} |u_n(x) - u_n(y)|^2 dx = \int_{y-\delta}^{y+\delta} |Du_n(x)|^2 |y - x|^2 dx \leq B^2\delta^2$$

This is a sort of integral equicontinuity that is inspired by the Arzela-Ascoli theorem. We want to know if this gives us subsequence convergence in $L^2[-R, R]$. That's the first idea.

To summarise the whole plan, we have reduced the problem to proving compactness of inclusion of H_R in $L^2[-R, R]$ by eliminating multiplication operator altogether. The general principle is to rush to a compact space and forget about the multiplication, make life simpler.

Then we want to modify Arzela-Ascoli theorem to an integral version and cross our fingers that this is sufficient for compactness of a family in $L^2[-R, R]$. We use a one-term Taylor expansion to use the Du_n.

So that's the plan. We do not claim a precise proof yet. All or parts of this plan could fail still because we have never done any integral Arzela-Ascoli theorem ever before.

23.3. **Return To Argument Of Arzela-Ascoli Theorem.** Some weeks ago, I had been examining subsequence convergence for a sequence of functions on $[a, b]$. There the issue was continuity to produce something. What I realise is that this particular argument was precisely a version of the *proof* of Arzela-Ascoli theorem.

It is really valuable to normalise our understanding of the issues that allow us to justify these subsequence convergence results. What I find is that it is really confusing to keep track of all sorts of conditions that lead to subsequence convergence in some cases and not in other cases.

Let me therefore try to clarify the mathematical source here. The issue is that when we are dealing with compact interval $[a, b]$ and we have some sequence of functions f_n, then whether we *apply* a theorem like Arzela-Ascoli theorem, of whether we bare-bones do something else, the crucial issues are the same.

We have to produce some sort of pointwise convergence at a finite number of points $x_1, \ldots, x_N$ if the functions are continous. This gets done by a Heine-Borel theorem application. Then we have to find some way of controlling the function near x_j in a uniform manner.

In the case of Arzela-Ascoli theorem it is equicontinuity that allows control near x_j. This understanding will allow us to gain some sense for Problem II.3.

Suppose $\delta > 0$ is very small, and we are given $x_1, \ldots, x_N$ in $[-R, R]$. What we do is consider integrals:

$$a_{jn} = \int_{x_j-\delta}^{x_j+\delta} |u_n|^2 dx$$

We want to prove that a subsequence converges. We have two constraints on u_n. We use $\|u_n\| \leq B$ to produce a subsequence so that a_{jn} converges for all $1 \leq j \leq N$. This is the analogue of pointwise convergence.

Then we use the bound

$$\int_{x_j-\delta}^{x_j+\delta} |u_n(x_j) - u_n(x)|^2 dx \leq \delta^2 B$$

to bound the "variation" uniformly so that we can get convergence in $L^2[-R, R]$ of the subsequence.

This is the broad idea still. You might be an efficient analyst who hates imprecise floofy nebulous thought. But I am more concerned with broad ideas than with precision proofs still.

Remember that the substance here is that $j_R : H_R \to L^2[-R, R]$ is compact, i.e. that there is a subsequence of a bounded sequence in H_R that converges in $L^2[-R, R]$.

Looking at Arzela-Ascoli theorem, we understand that the substance is precisely that we can do something in a finite number of points using some sort of regularity of the functions. In this case the regularity is an integrated quantity. And then we patch together pieces and massage the limit and argue that it gave us a L^2 limit.

This is very good because it tells us that in this problem compactness really did matter, and so our decision to use $\|Mu\| < \infty$ to cull the noncompact ends of $\mathbf{R}$ was not just a good idea but the *only right idea*.

23.4. **Further Comments.** This is really a beautiful re-inforcement that very elementary real analysis results like Heine-Borel theorem on compact real intervals are building blocks for Sobolev compact embeddings and it does not have to be messy to introduce lots of small δ-balls and do analysis around finite numbers of points taking a subcover.

In the real analysis course I took with Nick Katz, Lebesgue integration was new to me, that's 1992, and so it was hard to distinguish various sorts of things that were appearing. There is a psychological block that happens when people put in Sobolev norms where we are impatient with elementary real analysis. But this is bad. We should feel comfortable with taking δ-balls especially for compactness of sets of functions. Arzela-Ascoli theorem is really the core of all these compactness, and localisation to a finite set of points and applying Heine-Borel is really the fundamental reason for fancier compactness.

I have learned this lesson the hard way, because there is no real way to avoid it and it is good mathematics. The true master of the transitions at different levels was Elias Stein. He had an uncanny sense of how to jump at all levels of sophistication with such lucid lectures and prose that one would be mesmerised into believing that all of this was as simple as water. Of course the trouble is when you are doing some problems yourself and you did not really absorb things well enough. Elias Stein was so erudite in Analysis that he could just smoothly introduce all manner of extremely elementary things and make all things seem like child's play but you should not try that at home. Just word to the wise. He was a truly *learned scholar* because he spent years of his life mastering all of it. In fact he was frankly so out of place. I can imagine having a good time in the company of Avicenna or some of these medieval polymaths easily. They would not even know that he does not really belong in their time.

24. Ah Well Western People Underestimate Avicenna

Avicenna was one of the greatest geniuses of world's history. He is the *father of modern medicine* even though his life was 980-1037. In fact much of Thomas Aquinas' theological work was derived directly from Avicenna as well. He was a profound genius, with vast learning and originality. He is the the theorist of Romantic Love that took European Nobility by storm. Joseph Campbell pretends that twelfth century troubadours invented the new primacy of ennobling qualities of love. It was Avicenna's theory. So Europeans decided to nix him in 1250s but his thought was in the background of the entire European Renaissance because the Muslims had done the great scholarship on Plato and Aristotle between 800-1100 AD and not Western scholars. Anyway, Avicenna is a great figure in world's intellectual traditions.

25. My Improvements Over Aristotle's Virtue Theory

I have some results that show that Aristotle's Virtue-Eudaimonia theory is true with empirical data from World Values Survey. But I discovered weaknesses when mating-virtues were included. Then I followed Avicenna's Romantic Love theory and produced the full spectrum of Virtues and used some others' results to produce the Rosetta Stone of Life Satisfaction for human beings. I also extended Romantic Love before human evolution 7-8 million years ago to prove Love came before growth of Intellect. Then I challenged the Western theories of morals as well with Universal Human Moral Nature and showed Friedrich Nietzsche's theory and Immanuel Kant's theory were both wrong. The main theme is that human moral nature is natural product of long evolution. This theme was already considered by Geoffrey Miller of UCLA some two decades ago. But I have empirical work he did not have then. This is a great breakthrough for several millenia Western Thought was misguided about Human Moral Nature. These are works that deserve tenure considerations at Stanford, Harvard and other great universities.

26. It Is Quite Obvious That Bill Gates Was a Bad Student All His Life And An Intellectual Charlatan

Years ago, I liked the story of Bill Gates the college dropout succeeding. I did not think about it much more. I graduated magna cum laude from Princeton. I was actually a good student, even though I was sloppy in some courses at Princeton, and annoyed Stanley Corngold. Well, I did try to make up for that. I have several books of Corngold with me. *Necessity of Form*, *The Fate of the Self* and *Complex Pleasures* and I have been slowly gaining deeper understanding of some of these issues that were left loose from undergraduate years. I read Kafka with zest for years; I even read his biography, *The Nightmare Of Reason*. My natural inclination is towards Romanticism and Modernism in European Literature. But I do not have ambitions to be a professional in Humanities. I do this for my own personal pleasure. That's not really right. I do it because my life would be meaningless without this, for nourishing my soul, as I always discover things about myself and about life in the universe that astound me through this study.

Bill Gates is an intellectual charlatan through and through. I never met him physically, but I have dealt with his aggression and malevolence in meta. What you realise, in the end, is that the most parsimonious explanation is the best. Bill Gates was always a bad student, and even though he had some potential, for he got 1290 (and not 1590) in his SAT which is good. I got less the first time, 1170. The second time I had 1450 without prep course but with more serious effort.

He has projected colourful stories of his college-dropout. But the truth is very simple. He was not *any good*. If he had been serious about scholarship he would have done what normal people who are serious do, after his time away he would have returned to Harvard and completed his bachelors and perhaps even gotten higher education. Instead he began to believe his own bullshit about his innate genius without any study by gaining power to tyrannise over his betters in scholarship and repeating 'trivia' to everything and making documentaries about imaginary great mind.

He's an interesting huckster and charlatan, but he is definitely a charlatan and not an intellectual genius of great stature. He's a showman and total pathological liar and con man.

27. Problem II.2

Ah, the Fredholm operator issues. Here X, Y are Hilbert Spaces.

(a) Suppose $A \in L(X, Y)$ has closed range and finite dimensional kernel. Then

$$\|x\|_X \leq C(\|Ax\|_Y + \|Fx\|_X)$$

(b) If $Y/Ran(A)$ is finite dimensional then

$$\|y\|_Y \leq C(\|A^*y\|_X + \|\tilde{F}y\|_Y)$$

27.1. **Problem II.2(a).** Let $N = Ker(A)$ and $W = N^\perp$ so $X = N \oplus W$ is an othogonal decomposition. Let $F : X \to N$ be an orthogonal projection. Now A is injective on W which is closed because it is an orthogonal complement of a closed set. Therefore W is a complete Hilbert space. Since $Ran(A)$ is closed it is a complete Hilbert space.

The map $A : W \to Ran(A)$ is surjective and injective and so there is a bounded inverse $S : Ran(A) \to W$ by Open Mapping Theorem (the set theoretic inverse exists by injectivity and surjectivity and Open Mapping theorem says it is continuous). So we have

$$\|Sy\|_X \leq C(\|y\|_Y)$$

Now we change C if necessary and set $y = Ax_0$ and add $\|Fx_1\|_X$ to both sides

$$\|SAx_0\|_X + \|Fx_1\|_X \leq C(\|Ax_0\|_Y + \|Fx_1\|_X)$$

Any $x \in X$ has decomposition $x = x_0 + x_1$ with $x_0 \in W$ and $x_1 \in N$ so the above inequality becomes

$$\|x\|_X \leq C(\|Ax\|_Y + \|Fx\|_X)$$

27.2. **Problem II.2(b).** We need to prove the analogue of (a) for A^*. Let's prove that $Ker(A^*) = Ran(A)^\perp$ first. Suppose $yinRan(A)^\perp$. Then for for every $x \in X$ we have

$$0 = \langle y, Ax \rangle = \langle A^*y, x \rangle$$

This proves that $y \in Ker(A^*)$ because if $\langle w, x \rangle = 0$ for all $x \in X$ then $w = 0$.

Then we need $Ran(A^*)$ is closed. Let's come back to this. Once we have closed range and finite dimensional kernel (which we have now) we apply (a) to get the result.

Let's say $x_n \in Ran(A^*)$ converges to $x \in X$. Then we have y_n with $A^*y_n = x_n$ converging. For all $w \in X$ we have

$$\langle A^*y_n, w \rangle \to \langle x, w \rangle$$

Then we get

$$\langle y_n, Aw \rangle = \langle x, w \rangle$$

for all $w \in X$. Let me think a bit okay?

Let me try to prove that everything in X that is in the complement of the nullspace of A is in the range of A^*. Suppose $w \in X$ is orthogonal to $Ker(A)$. Let $y = Aw \neq 0$. Then

$$0 \neq \langle y, y\rangle = \langle Aw, Aw\langle = \langle A^*Aw, w\rangle$$

We want a conclusion that $w \in Ran(A^*)$. This is still unclear.

If we can prove $Ran(A^*) = Ker(A)^{\perp}$ then obviously A^* has closed range. This is still not extremely clear to me.

28. Problem II.1

(a) Show that $C^{\infty}[0,1]$ is dense in $L^p[0,1]$.

(b) Let H be a separable Hilbert space and I change notation and let (e_n) be basis and (y_n) be a sequence. We need to show equivalence of

(i) $\lim\langle x, y_n\rangle = 0$

(ii) $\|y_n\|$ is bounded and $(e_m, y_n) \to 0$ for each $m \geq 1$.

28.1. Comments on Problem II.1(a).

We could do this as follows. We could prove that e^{inx} is a basis for $L^2(\mathbf{T})$ and these are smooth and then show their spans in $L^p[0,1]$ is the entire space. This is Riesz-Fischer Theorem.

28.2. Problem II.1(b).

For (a) implies (b) we consider $T_n x = \langle x, y_n\rangle$ as linear operators. We have

$$\sup_n \|T_n x\| < \infty$$

for each x. Then Banach-Steinhaus Uniform Boundedness Principle gives us

$$\sup_n \|y_n\| \leq C$$

Then we consider $\langle e_m, y_n\rangle$ these all go to zero by assumption in (a).

For (b) implies (a). Any $x \in X$ can be written $x = \sum_m a_m e_m$ with

$$\sum_m |a_m|^2 < \infty$$

so

$$\langle x, y_n\rangle = \langle \sum_m a_m e_m, y_n\rangle$$

Now we want to be a bit careful here. We want to jump to the conclusion that we pull out the sum and apply limit as $n \to \infty$ and get a lot of zeros summing up.

The story here is that we can do that because $\|y_n\| \leq C$ for all n uniformly in n. But at the moment we assert this with handwaving since we need to think about the reasoning more carefully.

So we put a white handkerchief, and put it inside a Princeton ring and start fluttering our hands and say dismissively "Well as we can see ¡¡flutter flutter¿¿ things work out and we get the result."

By the way, you have to try it. It will infuriate your audience to no end. I can show you how it works. You take a white handkerchief and put it in a Princeton ring and flutter your hands when you are trying to avoid doing the details. The audience will be quite annoyed because you're doing that royal thing without actually doing a royal proof. But they might be so infuriated that they will keep their irritation to themselves.

Try it. They will be fuming.

29. I Will Show You Domestication Bill Gates You Stupid Cunt

Bill Gates is now promoting his plan to enslave and *domesticate* non-white people as slaves. I will show the stupid cunt Bill Gates who is not even worthy to be anyone's slave domestication. We will fling the little twit all the way back to Hell where he belongs.

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