On Neutronic Functions and Undefined Figures in Prime Distribution

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Abstract:

I introduce a function useful for defining any random or seemingly random values whether involving figures divided by zero, undefined and infinite limits of both real and imaginary numbers. With this function and a number of related, provable theorems, it is shown that the Riemann Hypothesis is true and brings into play the notion put forth by Jordan that a simple closed curve contains two discontinuous regions—an inside and an outside. Upon exploring these areas, a new basis and greater depth of Mertens' Function comes into view, as little has been made known to date of the function other than its intimate relationship with the Riemann Hypothesis. These functions are put together to reveal a new function whose difference from the Prime Number Function (2, 3, 5, 7, 11…) to infinity is zero, as well as a function whose difference from the t function (14.1347…, 21.0220…, 25.0108…) to infinity is zero, which can be arranged to a yet another function that takes all the non-trivial zeros of the Zeta Function to infinity, all having a real part of ½.

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Introduction

I should begin by acknowledging the credit due to the individuals who have paved the way for the greater content in this paper. I have thus made every possible effort to cite appropriately. However, after setting forth in the research of this topic, I repeatedly found that it was more appropriate to credit just those who played a direct impact on the information required to fulfill the document. This is not without due regard to the many un-cited works before this, which have bordered closely on the aspects of my research; rather, it is designed for the absolute simplicity for the reader that anything other than direct involvement with the proofs contained have been omitted. In any case, wherein lies the proof that all the non-trivial zeros of the Zeta Function have a real part ½ [19]? In the first part of this paper, it lies in the identity of the following Helge von Koch 1901 result, which states that if the Riemann Hypothesis is true, then the following is also true.

$$\pi\,(x) = Li\,(x) + O\,(x^{1/2}\log x) \tag{1}$$

However, I will be working through the weaker definition, which is identical to the Riemann Hypothesis, as the above, according to Riemann himself, is only "valid up to quantities of the order $x^{1/2}$ and gives somewhat too large a value; because the non-periodic terms in the expression for $F\,(x)$ are apart from quantities that do not grow infinite with x" [19], where of course he was referring to the function that is now called $J\,(x)$ and no longer $F\,(x)$. However, it is said that Riemann was not exactly precise in the $x^{1/2}$ part; it is actually $x^{1/2+\varepsilon}$, where ε is considered the error term [7]. Thus, the weaker von Koch theorem today is expressed as follows:

$$\pi\,(x) = Li\,(x) + O\,(x^{1/2+\varepsilon}) \tag{2}$$

And because the inverse of the Zeta Function is equal to the sum of the Möbius Function (the sum of which is called 'Mertens' Function'), and the behaviors of this function μ and Mertens' M are closely tied to the Riemann Hypothesis, a proof of (3) below would undoubtedly and directly explain that the hypothesis is indeed true [7]:

$$M\,(k) = O\,(k^{1/2+\varepsilon}) \tag{3}$$

The term I gave the mathematics used to prove the Riemann Hypothesis, even before it had been discovered, was Neutronics, as it was system first envisioned to provide the means to define the seemingly random growth of patterns throughout nature. The word has later come to me to mean the neutralization of any periodic mathematical pattern or function in relation with linear growth, as well as exponential growth, which are both also common patterns found throughout nature that can be directly linked to this function. But also I will provide functions that calculate all the prime numbers and all the zeros of the Zeta Function to infinity with some error term, whose summed difference = 0 for both that can be taken to infinity, thus revealing that all the non-trivial zeros have a real part ½. I also introduce an imaginary version of the Zeta Function, called the Neutronic Zeta Function, which allows one to calculate the zeros with rapid convergence.

To answer a common question, as to what mathematicians may be missing or ignoring in regards to the Hypothesis, why it might have been so difficult to prove, one should consider the following.

$$? = \frac{\kappa}{0} \tag{4}$$

Like most mathematicians, he or she would likely do nothing with this, as it is a known taboo that one cannot divide by zero. The best thing to do in such cases is avoid this situation altogether [7]. However, consider for a moment the following problem.

$$Li\,(1) = \frac{1}{\log\,(1)} \tag{5}$$

Of course log (1) = 0, and so we cannot currently solve precisely for *Li* (1) to even begin, much less solve for the sum of any *Li* (*x*) values to follow with any amount of precision (though indeed some mathematicians working in this area may presently be contented with it as is). In practice, one must educatedly "finesse" the numbers around it, knowing already where it is headed [7].

However, these undefined figures are found throughout mathematics, in particular, equations near and dear to the Riemann Hypothesis. Be that said, it will not be found throughout this paper anywhere that I write or suggest that a number divided by zero = zero. But would it not be curious to learn that the essence of the hypothesis from this perspective could rest on this subject, right where the conflict arises, at the center of Jordan's proven theorem [4 & 5], which states that every simple closed curve, a circle for instance, splits the plane into two regions, one inside the circle and one outside it, and that it is impossible to pass continuously from inside to outside, or visa versa without crossing that curve [15].

Neutronic Conventions

There are many variables and functions presented in this paper and a good deal of mathematics techniques that are just being discussed for the first time herein. While it is understandable that the reader may not follow my train of thought in all areas at all times, it was certainly not my intention to do this in the least. In fact, to help clarify many of the equations, I use as many tables and graphs as I feel relevant to give the first handful of values the different functions discussed; this is, in my opinion, an ideal way for the reader to compare his or her math and/or understanding with what I am attempting to express visually, as well as mathematically.

Having read a great number of mathematics papers, I have come across a variety of different usage of subscript variables with varied meanings. In this paper I only mean one thing with all my subscripts: f_x, for example, means a value of $f(x)$, where $f(x)$ is the title of the function and is only used when referring to these values in an equation unless it is specifically needed to refer to a value f_x. And even sometimes I refer to two or more values f_x in a single equation, for example $g(x) = f_x + f_{x-1}$. This simply means that to solve for $g(2)$, we simply add the values from function $f(x)$, which are $f(1)$ and $f(2)$. While this may be obvious to many, if not most, because it is my intention to most clearly express the research herein, which is itself sometimes apart from modern mathematic understanding, I feel it necessary to clarify my terminology on this point.

As mentioned, there are a good number of new functions presented in this paper, so I feel it most appropriate to clarify my style-guide throughout. It is simple to follow once explained, but without first discussion on these points any reader could quickly become lost and lose sight of the statement of which I am trying to make. The guiding line is this: if the function is presented as exceedingly important, I signify it with an uppercase Greek symbol, such as $\Pi(x)$ or $\mathrm{A}(x)$. If the function is less important and/or incredibly simple and straightforward, but still at play in some larger context, I use a lowercase Times New Roman letter, such as $f(x)$ or $a(x)$. For equations already commonly used in the Riemann Hypothesis, such as $\zeta(s)$ or $J(x)$, I do not change anything with them at all; they are a part of history and remain as is. Constants throughout this document, with the single exception of e (Euler's number) are denoted with a lowercase Greek symbol, such as π or φ. The only other usage for lowercase Greek symbols is when an arbitrary number is being expressed or in the case of the variable ξ, which is constant for one instance, but increases in another (this will be explained further). The only cases where I use lowercase Greek symbols for arbitrary numbers are in the first part of the paper and those exceptions are γ, ν & δ. These guidelines otherwise are strictly followed throughout this text.

Lastly, there is a required formality I follow that is not entirely straightforward; it is in the cases where I use the following variables: $\mathrm{N}(m)$, ρ, m, d, b, πy and πyi. In all cases throughout this paper with the single exception of Riemann's roots, the non-trivial zeros, ρ, the Greek Rho, means a value of $R(d)_{\mathrm{m}}$, the residue sequence for divisor d. The expressions $\rho f(x)$ or $\rho a(x)$ would mean that the values of these functions coincide with a function $f(x)$ or $a(x)$ that are all treated as values in the residue sequence for divisor d or function d (x). While I could have simply referred to them as f (x) or a (x), it is important to add the ρ in front to keep it clear where that function will later be used. It is all part of its definition. I use similar terminology for m, d and b. So mf (x) or df (x) are both functions whose values would be used as a modulo or divisor respectively in another function with a common x. However, πy and πyi are not used in this way at all; I apologize to the reader ahead of time for any possible confusion. In all cases, πy (x) and πyi (x) mean the value π (≈ 3.14159) multiplied by the real or imaginary function y (x). Because of a Theorem I present later, I leave the Pi symbol visible outside of the function itself for reasons that should become clear as one reads. The expression N (m) refers to what I call (and will describe in depth) a Neutronic Function. I say *a* instead of *the* Neutronic Function because there are an infinite number of them; N (mf) is one; N (ma) is another, and so on. The Neutronic Function is a way of handling a given modulo, as will be shown. And since the variable m_x always changes with x, N (m) will also change with x. While these points may become obvious in the pages to come, I did want to give an added explanation of this, as it is right at the heart of my proof.

With a solid understanding of the above points, the reader should have a great chance of following me completely. While I do not feel it necessary to show all my math, such as reductions, rearrangements or the like, not even with Complex Arithmetic, I do describe as best I possibly can to describe the meaning of nearly all my equations is at least a short word or two in plain English. So many papers today leave too much room for the reader to make assumptions, which I do feel is completely abhorrent. With that said, I do still make this mistake myself from time to time as well; it seems to me to be an unruly habit of many a modern mathematician. However, I have tried with all my might to keep the reader informed with every step I make throughout; but I clearly own the fault when the reader does not follow and offer my apologies herein if such comes about. With all that said, I shall now divulge my purported proof of the Riemann Hypothesis

The 'Neutronic Function'

The origin of this function lies at Pascal's algorithm, of which he attempted to determine if arbitrary ɣ is divisible by some divisor d, also an integer.

$$\rho_0 = (m_0 \bmod d) \equiv 1,\ \rho_1 = (m_1 \bmod d) \equiv 2 \tag{6}$$

Where, the infinite sequence is $R\ (d)_{\mathrm{m}} = (\rho_0, \rho_1, \rho_2 \ldots)$ the residue sequence for divisor d, base m [8]—clock mathematics. And while Pascal never intended anything other than integers to be considered values in clock mathematics, some individuals have expanded on that, particularly in computing. After all, many (if not most) programming languages today allow the mod function to be applied to floats as well as integers. To explain how this is done for the methodology presented herein, the theorem of the Neutronic Function must first be introduced.

Neutronic Theorem:

Any set of random (or seemingly random) periodic values ρ_x can be infinitely defined (meaning that there are an infinite number of solutions for the order of the values) in reverse with a simple function N (m), the Neutronic Function.

$$\mathrm{N}\,(m) = \frac{m_n - \rho_n}{d_\xi} \ldots \frac{\mathrm{m}_2 - \rho_2}{d_\xi}, \frac{m_1 - \rho_1}{d_\xi} \tag{7}$$

Which always ends at zero. I refer to this as in reverse, as the simple Neutronic Function starts with a list of given values that is defined in the reverse order for which they were received. This also can be expressed as follows:

$$\mathrm{N}\,(m) = \frac{m_{x+1} - \rho_{x+1}}{d_\xi} \tag{8}$$

Where $\rho = m \bmod d_\xi$ when m is any integer, ($m \bmod d_\xi$) + z when m is any real number and ($m \bmod d_\xi$) + zi when m is any complex number—and (importantly) where d (1) of d (ξ) (the divisor of which arbitrary γ is divisible by) is any integer $\geq \rho_{max} + 1$, which is denoted a function in order to express the infinite number of solutions possible for ρ. The convention for expressing the variable of the function d (ξ) as the Greek ξ is because in most cases it changes independently from x of its related functions. In other words, to define one instance of N (m), d_ξ is constant while x from its related functions all change by increments of 1. To define the second instance, the value is $\rho_{max} + 2$, and so on. Since every integer d (ξ) can be represented as the difference $\nu - \delta$ of some natural numbers ν and δ, the same integer can be represented as the difference of many different pairs. We can then define d (ξ) as the set of all pairs of natural numbers so that $d_\xi = \nu - \delta$ [17].

When calculated in reverse, provided the largest ρ (denoted ρ_{max}) of the Neutronic Function is known (defined),

$$\mathrm{N}\,(m) = b_x^x \tag{9}$$

Where b_x is a value of f (b), which is any function that provides a solution for the following:

$$\frac{m_{x+1} - \rho_{x+1}}{d_\xi} = b_x^{\,x} \tag{10}$$

And when the above is true,

$$\lim_{1 \to \infty} b_x = d_\xi \tag{11}$$

N (m) needs not be simple in all cases even though the values of the pattern may be finite. The function may also be taken to infinity continuing the process in the same manner.

Proof of the Neutronic Theorem:

In order to prove this I shall use given values that will later become directly involved with the Riemann Hypothesis. I will explain in time where these values come from, but for now, beginning with what we shall call $\rho o\ (x)$, the values of a seemingly random periodic function $o\ (x)$, one studies the given list of values. Table 1 gives of sample of these, using five decimal places.

TABLE 1

x	$\rho o\ (x)$
1	.00487
2	.42608
3	1.55549
4	6.40971
5	8.88615
6	37.76965
7	30.43546

Graphing the above values up to $\rho o\,(66)$,

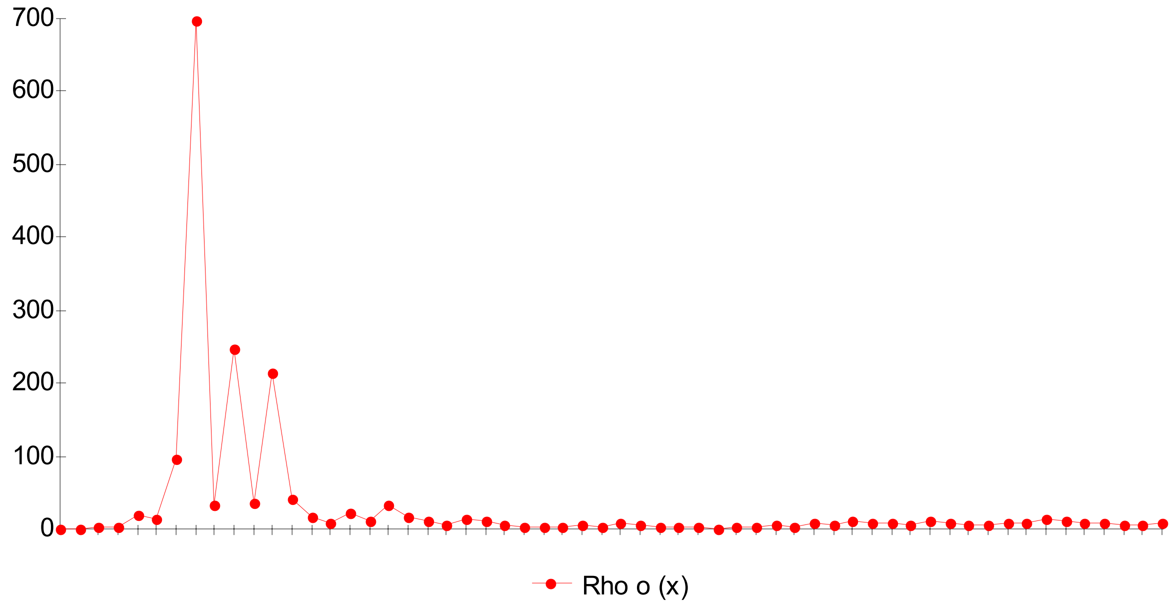

FIGURE 1 The function $\rho o\ (x)$

One can see that the values, other than those between $\rho o\,(6)$ and $\rho o\,(16)$, stay comfortably under or around 30. Such wildly intermittent values can then become a good candidate for a Neutronic Function of the real numbers.

The first order is to separate the integer part $Int\ (\rho o)$ that has a common divisor d_ξ from the real part $Re\ (\rho o)$. This can be done with most programming languages by simply using the mod function for real numbers. However, doing this by hand gives a clearer picture, and it may be a more precise method considering Pascal's definitions. By using d_1 for real numbers, which is 2, as 1 is the first natural number, and according to Theorem 1, d_ξ is any number $\geq \rho_{max} + 1$, we get the following (though please carefully note that there is really no ρ_{max} involved when separating the two parts, only when placing each part into a Neutronic Function, which will come later):

$$\rho o\,(x) = Int\ (\rho o) + Re\ (\rho o) \tag{12}$$

Table 2 gives a sample of the first seven values using five decimals.

TABLE 2

x	*Int* (ρo)	*Re* (ρo)
1	0	.00487
2	0	.42608
3	0	1.55549
4	6	.40971
5	8	.88615
6	36	1.76965
7	30	.43546

Where we can now see that the integer parts are all divisible by 2 and the real parts all are O (2) (big oh of 2), and this needs no more proof, as we deliberately cut off any real part of ρo (x) forcing it to be < 2. In this paper, I will not delve into the functions for the residue of *Re* (ρo) mod *do* (ξ) in order to save research for the proofs of these theorems, however, the same can be done for them if one so wishes. Instead, I will leave the big oh definition as a means to suppress the secondary information in an asymptotic region, which is only needed as a binary operator to indicate the relative growth of ρo (x) or other functions pertaining to the theorem [2].

Since all the integer parts are divisible by 2, it will help things by dividing all the Integers by this 2 to bring down ρo_{max} for the Neutronic Function, remembering of course later to multiply it back in to complete the equation. It is always useful to keep ρ_{max} as low as possible, to help control the growth to manageable values when considering (10), which climbs quite fast. Now one can look at the seemingly random fluctuations of just the integers, which we shall call *Int* (ρo). The first seven values are listed in Table 3:

TABLE 3

x	*Int* (ρo)
1	0
2	0
3	0
4	3
5	4
6	18
7	15

Looking, however, up to x = 66 and beyond, we see that ρo_{max} for all *Int* (ρo) is 698, which is at x = 9. Thus, *do* (1) = 699, which is $\rho o_{max} + 1$. We can also make the observation that the first three values of *Int* (ρo) = 0. However, before we continue, it must be strongly emphasized that a Neutronic Function always ends at zero. Take an arbitrary number and use d (ξ) = 6 (just for example). Let us use the number *17,633*. By placing it in the Neutronic function, we get the following values:

$$m_6 = \frac{17633 - 17633 \bmod 6}{6} = 2938 \qquad (13)$$

$$m_5 = \frac{2938 - 2938 \bmod 6}{6} = 489 \qquad (14)$$

And so on down to m (1), where $\rho = m \bmod 6$. Table 4 shows all seven values of N (m), including of course our first given value m (7):

TABLE 4

x	m (x)
7	17633
6	2938
5	489
4	81
3	13
2	2
1	0

The proof that m (1) is always zero is simple: the values of the Neutronic Function decrease to the point where m_{next} will eventually drop below d_ξ, which = 6 in the above case. Any number (m) < d_ξ will = m in $m \bmod d_\xi$. Thus, $m - m = 0$. And $0 / d_\xi = 0$. The function therefore stops, as any other value will be zero from there on. It should be strongly noted that since m (1) is always zero, and the function does *not* continue past that point, the first value of ρ must correspond to m (2) if ever ρ (1) > 0.

Considering now the above proof, defining the function *Int* (ρ*o*) with the lowest possible value of *do* (ξ), which is 699, one can rearrange (8) to solve for *mo* (x) in reverse, starting at zero,

$$mo\ (x) = do_\xi\ mo_{x-1} + Int\ (\rho o) \qquad (15)$$

TABLE 5

x	$mo\ (x)$
1	0
2	0
3	0
4	3
5	2101
6	1468617
7	1026563298

And so on to infinity as long as ρo_x is defined. Thus, it is evident that so long as d_ξ is an integer, in accordance with Pascal's definition and proofs [8], each value of ρ will always = m mod d_ξ no matter what number d_ξ is, provided that it is $\geq \rho_{max} + 1$. Thus, the pattern has an infinite number of solutions beginning from d (1) up to infinity.

We can then solve for bo_x, considering the next common log equation in (16) below:

$$\log (b_x^{\,x}) = x \log (b_x) \tag{16}$$

Thus, since $b_x^{\,x} = m_x$ where $f(b)$ is any function that makes (10) true,

$$b_x = e^{\log (mx) / x} \tag{17}$$

Where e is Euler's number. This allows one to calculate the values of $f(b)$ so far as we know the values of ρ (x), where it is possible to assign its complete value in terms of the remaining elective parameters that are known [3]. In this case, the first seven are listed in Table 6.

TABLE 6

x	$bo\ (x)$
1	Undefined
2	Undefined
3	Undefined
4	1.31607
5	4.61833
6	10.66149
7	19.37942

Where it becomes known with absolute certainty when solving for bo_x somewhere beyond bo_{1000},

$$\lim_{1 \to \infty} bo\,(x) = 699 = do_{\xi} \tag{18}$$

Where lim $bo\,(x)$ exists and is finite as $x \to \infty$. We can graph the following a little beyond bo_{100} to see how this function looks in its earliest stages.

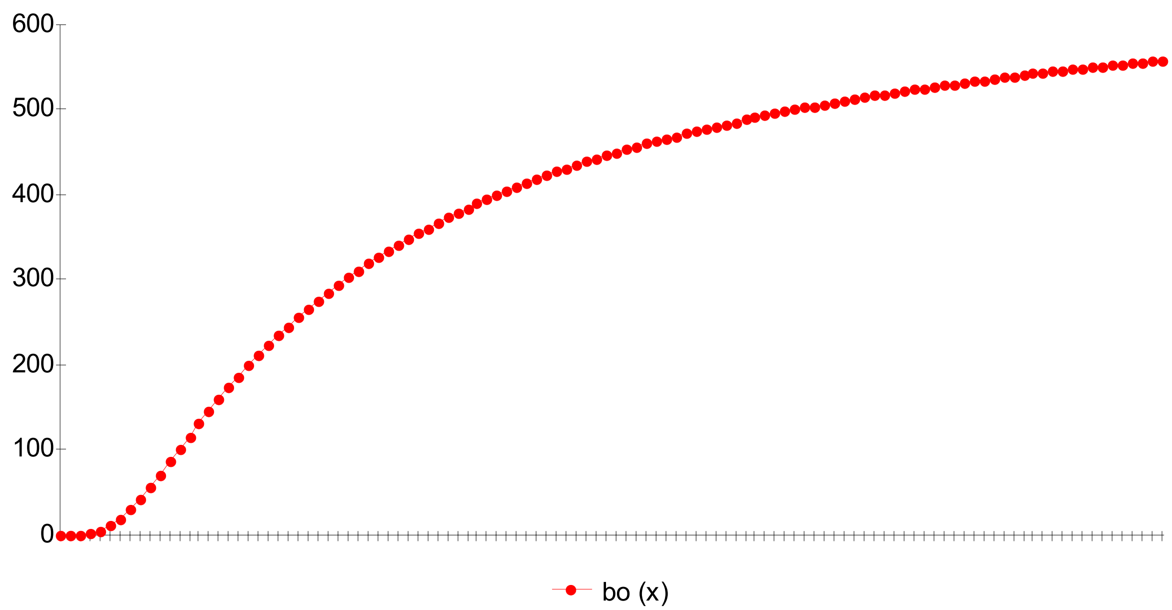

FIGURE 2 The function bo (x)

Now, it should be mentioned that before moving forward in the proof of the Riemann Hypothesis, the term $f\,(b)$ refers only to any function at hand that makes (10) true, and thus the theorem true. $f\,(b)$ is something of a generic term that can be used with any Neutronic Function. The values of $f\,(b)$ in the above equations will certainly not be the same in relation with another Neutronic Function. For functions that begin with fewer zero values, b_x converges more rapidly to d_{ξ} than in our current example. But what is absolutely certain is that b_x will always be > d_{ξ}, because of the subtraction of ρ_x in (8). This example above was simply used to introduce and prove the points of Theorem 1, but our function $\rho o\,(x)$ will later become more than just an interesting side-note in the proof of the Hypothesis, as solving for $f\,(bo)$ above and the $O\,(2)$ part of (12) can provide a precise means to calculate the absolute values of $\pi\,(x)$ from 1 - ∞.

The Role of Jordan's Theorem in Undefined Figures

Jordan's Theorem states that every simple closed curve (for instance, a circle) divides the plane into two compartments, one inside and one outside, and that it is impossible to pass continuously from one to the other without crossing the curve [15]. And though Jordan himself failed at proving this, it was indeed shown to be true with the use of Groupoid methods [4 & 5]. Suppose A is an arc in X. It can be shown that A is a union of subarcs and those subarcs are closed in X. Now, where A_1 is one subarc, one can find by repeated bisection of sequence Ai that $i > 1$ of subarcs of A. Now, for all i, the points a and b lie in distinct "path-components" and the intersection of the Ai for $i > 1$ is a single point: y of X [4]. But what does that have to do with the Riemann Hypothesis? To explain, a second theorem needs to be introduced.

Definitive Theorem:

A number divided by zero can be defined by extending it to a function $q\ (x)$, whose limit is zero as it approaches infinity, whose first value is equal to $q_2\ (\pm\ \pi y i)$ or $q_2\ (\pm\ y \log(-1))$, considering $e^{\pi i} = -1$ [21].

$$\frac{\kappa}{0} = \frac{\kappa}{q_2 - \chi} = q_2\ \pi y i = q_2 \log(-1) \tag{19}$$

Where κ is the known quantity divided by zero, $q\ (x)$ is *any* function that provides a solution to make the above true—and the constant $\chi = q_2 - (\pi y i)^{-1}$. The above imparts a quadratic equation for q_2.

$$0 = q_2^{\ 2}\ \pi y i + (-q_2\ \chi) + (-\kappa) \tag{20}$$

Using the quadratic formula, we get:

$$q_2 = \frac{\chi \pm (-\chi^2 + 4\pi i y \kappa)^{1/2}}{2\pi i \cdot y} \tag{21}$$

Where πi in all cases above is $\pm\ \pi i$, as we will be shown in the proof.

Proof of the Definitive Theorem:

While Jordan's Theorem is easily understood to be true but difficult to prove, the Definitive Theorem is difficult to understand to be true but is incredibly easy to prove. Please consider carefully the following proof. If we let a hypothetical radar screen to be our coordinate system,

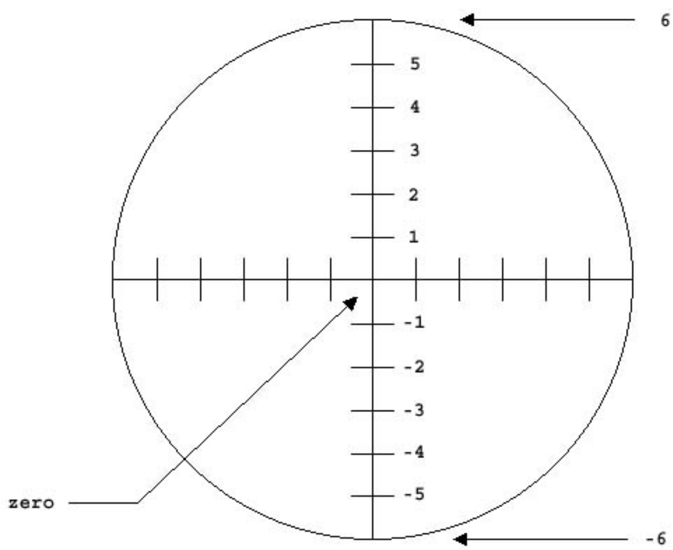

FIGURE 3

And it is our task to map and record the velocity (in *km* / *min*) of a point particle at each coordinate it travels, beginning from coordinate zero*,* while considering the distance between each coordinate to be 600 kilometers apart. And we know that the particle travels according to the unusual following pattern when traveling away from coordinate zero:

$$\text{Velocity} = \frac{60}{\text{Projected Coordinate} + 7} \tag{22}$$

Where the projected coordinates, we are informed, are simply -1, -2, -3… etc., working in increments of one. When the particle is traveling toward coordinate zero, the following equation dictates its movements:

$$\text{Velocity} = \frac{60}{6 - \text{Projected Coordinate}} \tag{23}$$

Where the projected coordinates are 6, 5, 4… etc., working also in increments of one. We are given that the particle will end its movement at the +1 coordinate.

The particle makes its first projected coordinate exactly in one hour, at –1, so we can calculate its velocity as 10 *km / min*. It makes it to the second coordinate -2 in less than an hour at 12 *km / min* and the third coordinate in even less time, 15 *km / min*. So, tracking this craft to the first six coordinates, we get the following velocities:

TABLE 7

Coordinate	*km / min*
-1	10
-2	12
-3	15
-4	20
-5	30
-6	60

Now, after leaving coordinate -6, the particle goes off the radar. Its location is undefined. We know this mathematically as well, as by continuing the pattern seen so far in relation with (22), we might project the next location to be an undefined -7^{th} coordinate, and therefore:

$$\text{Velocity} = \frac{60}{-7 + 7} = \frac{60}{0} = \text{undefined} \tag{24}$$

This is where the Definitive Theorem comes into play. Though the particle went off the radar, we see that in exactly one hour, it arrives at the $+6^{th}$ coordinate. How then is it possible to calculate its velocity? Firstly, we can track the particle to its end of the travels, to the +1 coordinate where we get the following velocities for each:

TABLE 8

Coordinate	*km / min*
-1	10
-2	12
-3	15
-4	20
-5	30
-6	60
±7	Undefined
6	60
5	30
4	20
3	15
2	12
1	10

Graphing the above values, we get,

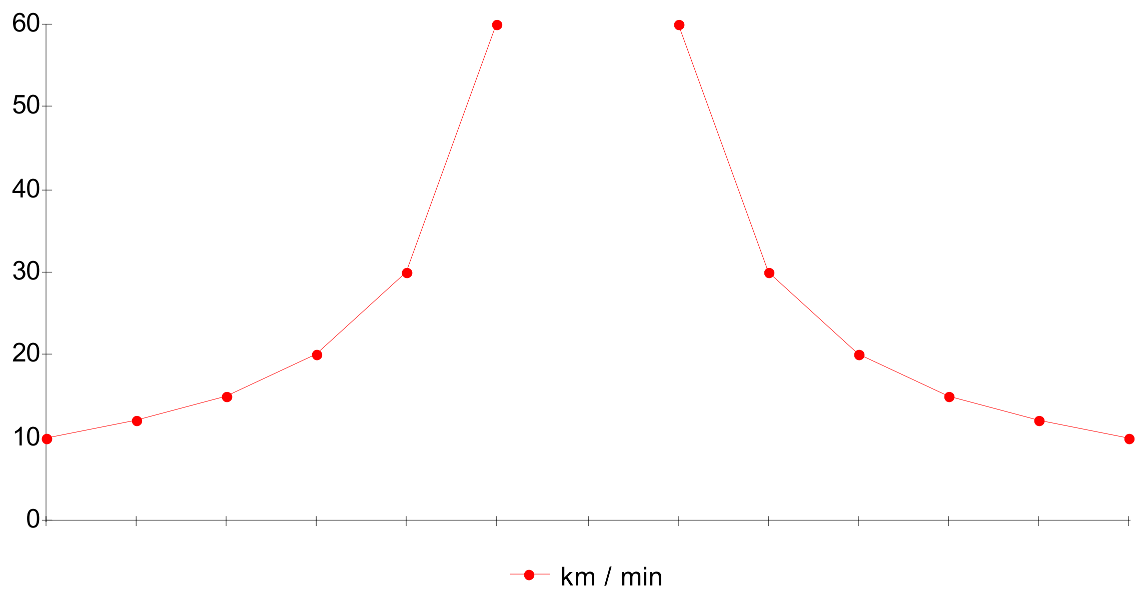

FIGURE 4 The point particle's velocity

One can see above that the particle must have traveled exceedingly faster than our 6th recording to get from the –6th coordinate to the +6th in one hour; in fact, it is precisely > 60π *km / min*. The radius that our radar covers is 3,600 km and its circumference is $2\pi r$.

The particle must have traveled at least half way around the radar's view to get to the $+6^{th}$ coordinate, and therefore, we get the following:

$$\text{Velocity at } 7 > \frac{1}{2} \cdot \frac{2\pi \cdot 3{,}600}{1 \text{ hour}} \tag{25}$$

The reason that the particle must have traveled a distance > ½ the circumference of the radar's circular view is because if it would have traveled at exactly 60π *km* / *min*, it would have never left our radar, as Jordan's Theorem explains. We also can see it for ourselves, as we were able to record firsthand the -6^{th} and $+6^{th}$ coordinates, which are indeed *on* the circle's edge. The precise definition for the velocity = $60\pi yi$ *km* / *min*, which extends this problem to the complex plane. Now, a few important items need to be described. The value πyi can be simply considered $\pi i \cdot y$, and always $y \approx 1$ for its first value of a function where it will approach a limit of $1 / \pi$. However, throughout this paper, π will often be separated from yi in order to solve the imaginary yi as a function yi (x). Lastly, since in most cases the functions will be handled with real numbers and because $y \approx 1$ at its first value, the imaginary i can often be left out when and only when working through a relationship between two functions that are asymptotically equal, so long as i is multiplied back into the final answer and there are no other imaginary or complex values in a particular equation, understanding all along that one is indeed dealing with an imaginary value or function. For example, πyi / Re (x) in an imaginary function of course. But if for instance a function ki $(x) = \pi yi$ / Re (x) and ki (x) is an asymptotically equal imaginary counterpart to k (x), then one can in some cases divide out the i from ki (x) until a solution is found and then it can be multiplied right back into the final equation to correctly fulfill its imaginary definition. This will become clearer as one reads on.

Now we can extend either the particle's path from the zero-coordinate to the 7^{th}. Or we can take it all the way back to +1, depending on which avenue we take will determine whether we are discussing $xi + \pi i$ or $xi - \pi i$. So, taking the log of our newly calculated velocities (using log only in order to view a more controlled growth), now including our 7^{th}, we can graph our values as follows:

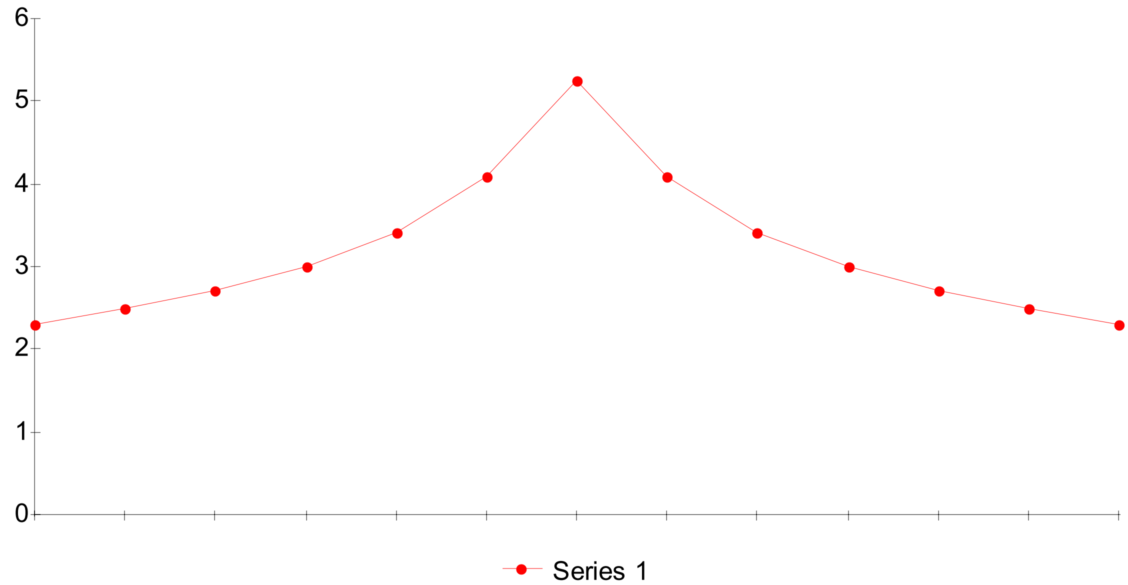

FIGURE 5 The log of the point particle's velocity

Where we get a steady and precisely accurate growth from our undefined figure, which leads to predictable solutions of the problem at hand.

Extending Undefined Figures to Neutronic Functions

Jordan's Theorem allows us to visualize the basis of the relationship between πi and undefined figures. However, in the real mathematical world, in the process of solving problems untouched so far with a Neutronic Function, a third theorem needs to be presented, as little has thus been explained about a number of points in the Definitive Theorem, primarily in respect to (19, 20 & 21). While (20 & 21) need not be proven, as they are mathematically obvious, provided (19) is true, the basis and usage of (19) only becomes completely clear when brought together with the Neutronic Function.

Definitive Neutronic Theorem:

The Definitive Theorem can provide a solution to seemingly random periodic values in the Neutronic Theorem, even if ρ_{max} is undefined (i.e. the function does not converge and/or the values of the pattern grow infinitely larger) using the following, which changes the restriction of $d_1 \geq \rho_{max} + 1$ for undefined limits:

$$\mathrm{N}\,(m) = \frac{m_n - \rho_n \pi y i}{d_\xi} \ldots \frac{m_2 - \rho_2 \pi y i}{d_\xi}, \frac{m_1 - \rho_1 \pi y i}{d_\xi} \tag{26}$$

$$\mathrm{N}\,(m) = \frac{m_{x+1} - \rho_{x+1}\, \pi y i}{d_\xi} \tag{27}$$

Where πi is actually $\pm\, \pi i$ in accordance with the Definitive Theorem. Or in reverse where yi becomes a function of its own to the inverse of b_x, with a defined limit or a new periodic (seemingly random) function that does indeed always have a ρ_{max}.

Proof of the Definitive Neutronic Theorem:

I will begin by expanding on the definition of (12), still using ρo as our now defined parameter, as ρo contains an integer part and a real part, where the integers can be defined by rearranging the equations in Theorem 1, as follows:

$$Int\,(\rho) = m - (d_\xi\, b_x^{\,x}) \tag{28}$$

Considering that $b_x^{\,x} = (m_x - Int\,(\rho)) \,/\, d_\xi$.

Now, if we want to extend this to a variable that will become useful in regards to the PNT, which we shall call o, which I shall for now say is given as follows:

$$\rho o = \frac{1}{o^2} \tag{29}$$

Then, our separation of the integer part from the real part in (13) allows us to bring the O (2) (the real part) in, making it a periodic function of its own, or function $Re\,(\rho o)$. Then we should multiply it by 2, which we remembered we needed to do from the paragraph after (12), where we divided the values by 2 to the control the growth of the Neutronic Function. We get the following:

$$\rho o\,(x) = 2\,(do_\xi\, bo_x^{\,x} + mo_x) + Re\,(\rho o) \tag{30}$$

Thus,

$$o\,(x) = (((2\,(do_{\xi}\,bo_{x}^{x} + mo_{x}) + Re\,(\rho o))^{-1})^{½} \tag{31}$$

Which completely defines the integer part, replacing it with a completely manageable function.

Again, it was mentioned that *Re* (ρ*o*) need not be touched on deeply in this paper (though it can too be defined as well), in order to focus on the variable *o*, which will, as mentioned, become important in the Riemann Hypothesis. We also can rename the generic term *f* (*b*) as *fo* (*b*), as I did for *d*, *b* and *m*. We can drop the functional element of do_{ξ} and leave only the value we used earlier to prove the Neutronic Theorem, which is 699 (though we should still always remember that there are an infinite number of other solutions for all numbers ≥ 1 + 698. So, finally, we will define *o* as follows:

$$o\,(x) = (((2\,(699\,bo_{x}^{x} + mo) + Re\,(\rho o))^{-1})^{½} \tag{32}$$

In order to prove our third theorem, we will examine further the function *fo* (*b*) in order to find a limit related to its inverse. The inverse of *fo* (*b*) cannot be calculated properly with real numbers, as the first three values are undefined; the first three values are zeros. However, if we take the fourth value and multiply it by πi, in accordance with the Definitive Theorem, we can extend it to the complex plane to get the third. Then we can do the same for the second and first values. We get:

$$\frac{1}{bo_3^{\,3}} = \pi y i \cdot \frac{1}{bo_4^{\,4}} \approx 2.3870942i \tag{33}$$

$$\frac{1}{bo_2^{\,2}} = \pi y i \cdot \frac{1}{bo_3^{\,3}} \approx 7.4992776i \tag{34}$$

$$\frac{1}{bo_1^{\,1}} = \pi y i \cdot \frac{1}{bo_2^{\,2}} \approx 23.5596755i \tag{35}$$

Where the ≈ symbols are used, as $y \approx 1$ at its first value. We can now accurately graph the first seven (or any value) of the inverse of the function, which we could not do without Theorems 1, the Definitive Theorem and 3.

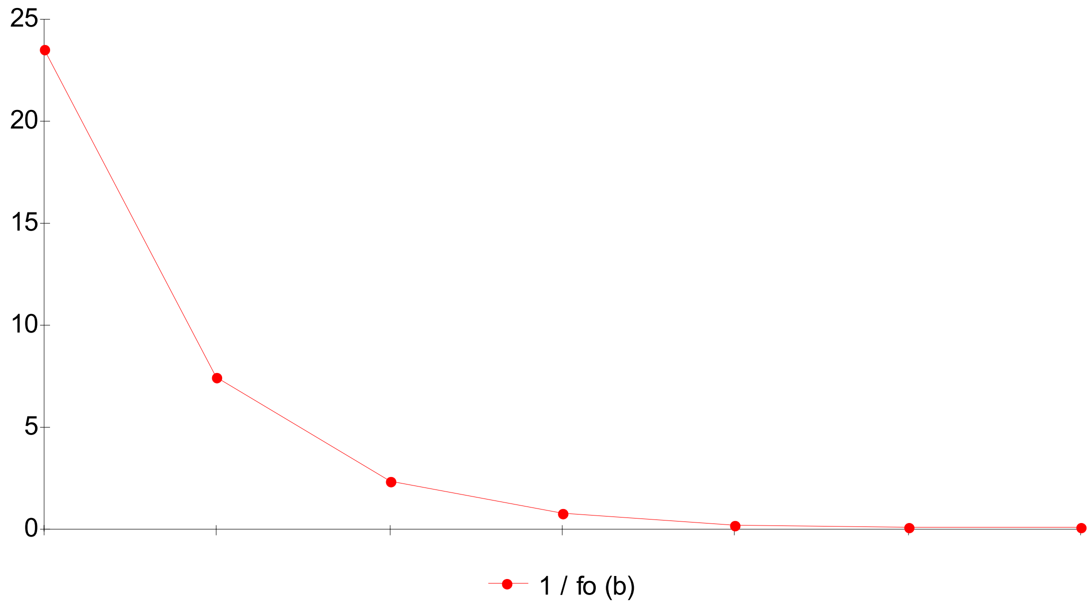

FIGURE 6 The inverse of *fo* (*b*)

Now, solving for *yi* (*x*) with the following equation, we get:

$$yi\ (x) = \frac{bo_x^{\ x}}{\pi\ bo_{x-1}^{\ x}} \tag{36}$$

Since $bo_x^{\ x}$ increases infinitely, the inverse decreases infinitely, leaving behind just $1 / \pi$ as the function approaches infinity, thus, the limit of this *yi* (*x*) function is as follows:

$$\lim_{1 \to \infty} yi\ (x) = \frac{1}{\pi} \tag{37}$$

And graphing the inverse of *yi* (*x*), one can see how its first three ≈ 1 values factor into the function.

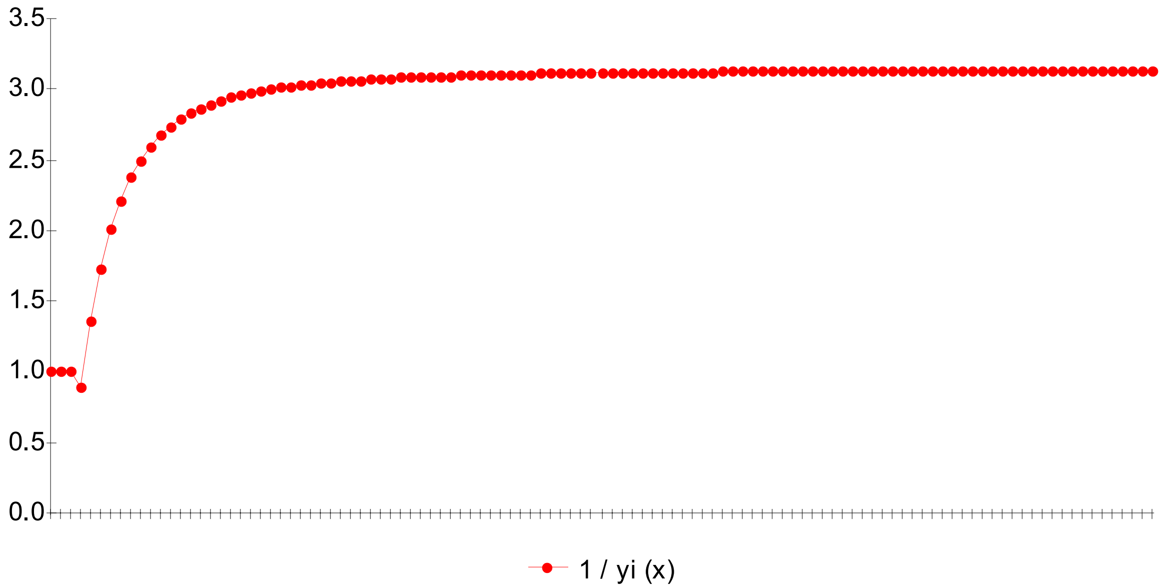

FIGURE 7 The inverse of yi (x)

Where the function begins at ≈ 1 and converges at π.

The main point of this theorem being that all yi (x) functions from the Definitive Theorem, when extended in this way, do indeed converge, including those of a periodic function that increase its fluctuations, growing infinitely larger, allowing a great number of possibilities when it comes to defining random number patterns that have no limit of their own. Then, in all Neutronic functions, yi (x) begins to cancel as $x \rightarrow$ infinity, attempting to eliminate the imaginary term of the equation. This is quite important to realize when beginning to discuss an inverse value related to Mertens' Function, coupled with the earlier comment that i can simply be divided out when working through the solution, so long as it is multiplied back in at the end. But it is a limit, meaning that it never does truly get removed completely; its influence on the results simply become less important as $x \rightarrow$ infinity. But for now, a more pressing issue needs to be addressed taking the previous 3 theorems into account.

We now must show that (26 & 27) are true. Now that we have redefined our values above, we can reuse the Neutronic Function with another periodic function ρv (x), one that has an undefined limit. The first seven values of the integer part of the function that grows infinitely larger is as follows:

TABLE 9

x	$\pi yi\ Int\ (\rho v)$
1	Undefined
2	0
3	1
4	1
5	52
6	1
7	12

We can use any integer $dv_\xi > 1$, as ρv_{max} is undefined, thus changing the definition from $d_\xi \geq \rho_{max} + 1$ to $\rho_{max} = \pm i$ for undefined limits. Thus, $d_\xi \geq \pm i \pm 1$. We will begin with 2, using the next equation.

$$mv\ (x) = dv_\xi\ mv_{x-1} + \pi yi\ Int\ (\rho v) \tag{38}$$

Table 10 shows a sample of the first seven values of this Neutronic Function.

TABLE 10

x	$mv\ (x)$
1	0
2	1
3	3
4	7
5	66
6	133
7	278

Table 11 gives the first seven values of integers of $\rho v\ (x)$.

TABLE 11

x	$Int\ (\rho v)$
1	0
2	1
3	1
4	1
5	0
6	1
7	0

And one can solve for $yi\ (x)$ using the next simple ratio.

$$yi\ (x) = \frac{\rho v_x}{\pi\ \rho v_{x+1}} \tag{39}$$

The first seven values of $yi\ (x)$ can be seen in Table 12.

TABLE 12

x	$yi\ (x)$
1	Undefined
2	$1 / \pi$
3	$1 / \pi$
4	16.55211
5	Undefined
6	3.81972
7	Undefined

Now, by multiplying πi by the value ahead of each undefined value, one gets the following values listed in Table 13.

TABLE 13

x	$yi\ (x)$
1	i
2	$1 / \pi$
3	$1 / \pi$
4	16.55211
5	$12i$
6	3.81972
7	$7i$

Where each undefined value preceding a defined value = πi *Int* (ρv) two places later, irrespective of whether or not ρv ($\pm \pi i$) = 2, 3, 4 or any number greater to infinity. And once ρ_{max} is known for all $\rho v \rightarrow 0$, the standard usage of the Neutronic Function can define the values even though it as a function would have no limit in the opposite direction.

Concluding the Definition of *Li* (*x*)

The importance of the function *Li* (*x*) in regards to the Riemann Hypothesis cannot be overstated, as anyone already working in this area well knows. Now that the above theorems have been introduced and shown how they work, we can move on with the Hypothesis and put them to use, which should make any items that remain unclear better understood. Firstly, *Li* (*x*) can be extended to the complex plane using the above theorems, as its first value is undefined, using the commonly understood function:

$$Li\ (x) = \frac{1}{\log\ (1)} + \frac{1}{\log\ (2)} + \frac{1}{\log\ (3)} \ldots \frac{1}{\log\ (\mathrm{n})} \tag{40}$$

As log (1) = 0, which leaves the first value undefined and therefore providing a previously non-precise sum of its values, but now a great candidate for the Definitive Theorem. By multiplying the second value by πyi, we can define this first value and thus calculate with absolute precision the entire sum to follow. We get the first using the next equation.

$$Li\ (1) = \pi yi \cdot \frac{1}{\log\ (2)} = \frac{\pi yi\ (1)}{\log\ (1+1)} \approx 4.5323601i \tag{41}$$

Using (41) and the above theorems, an imaginary *Li* (*x*) can be defined as the following:

$$Li\,(x) = \frac{\pi y i\,(x)}{\log\,(x+1)} \tag{42}$$

Which considers the first value (1 / log (1)) of the understood *Li* (*x*) = log (-1) / log (2), as *x* + 1 = 2, when *x* = 1. Graphing *Li* (*x*) in this way gives a better understanding of where it begins and where it goes.

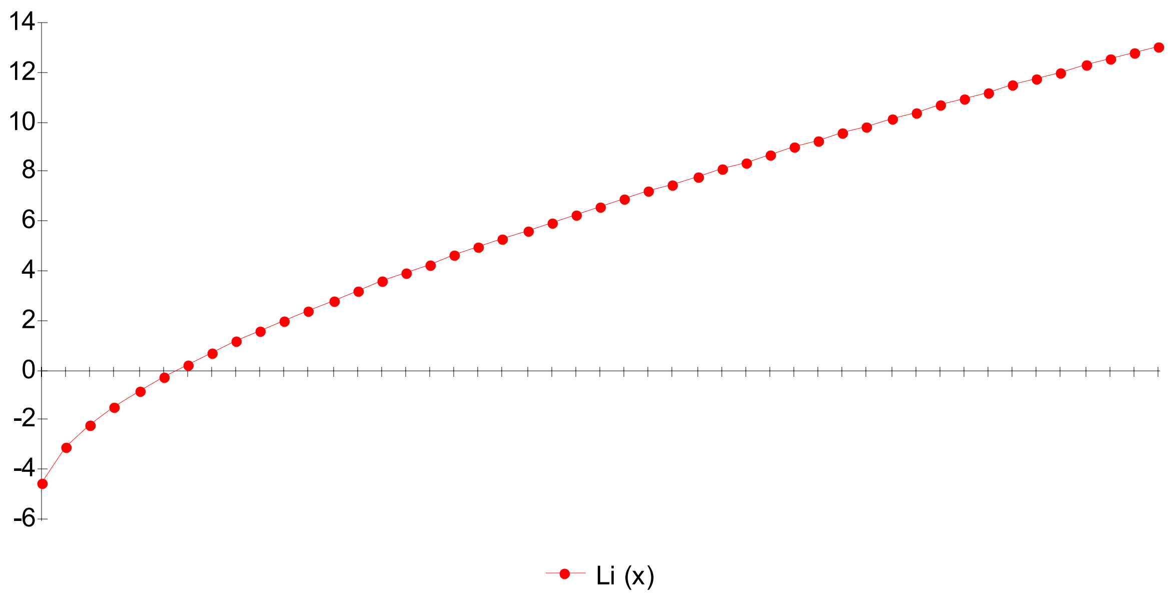

FIGURE 8 The function *Li* (*x*)

However, graphing it, first dividing out the *i*, alongside π (*x*), the Prime Counting Function, gives an even better picture. See Figure 9 below.

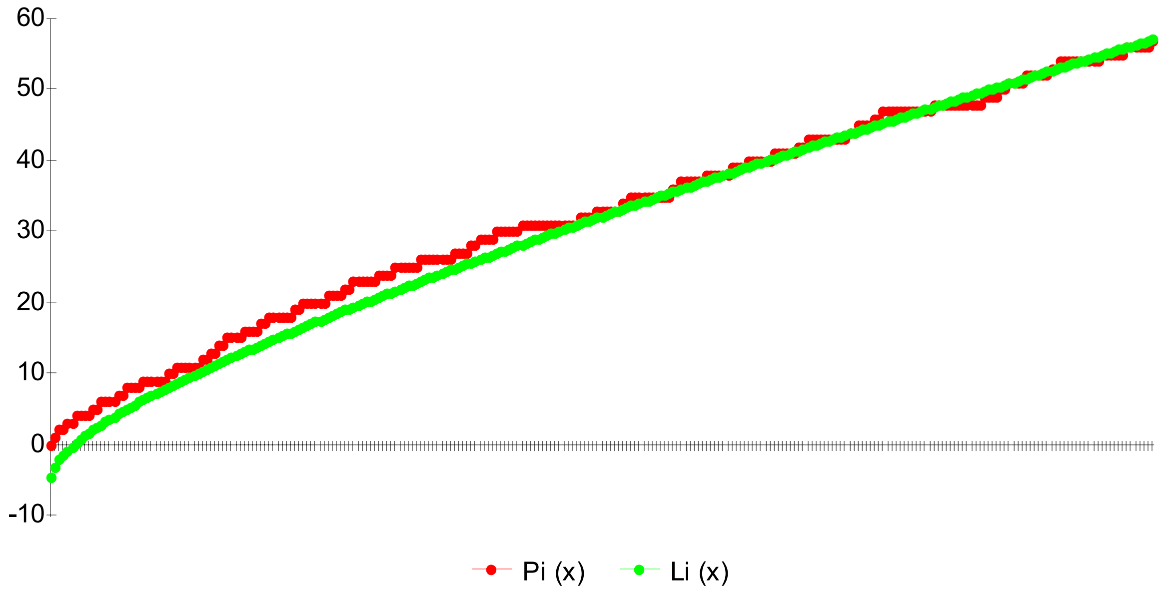

FIGURE 9 The functions π (x) & *Li* (*x*)

This, of course, is the Prime Number Theorem [9], a much better version in fact, that *Li* (*x*) and π (*x*) are the asymptotically the same, which has already been historically proven [12, 13 & 18]. However, without the Definitive Theorem, *Li* (x) has had somewhat different values, as the older kept them completely apart far into the thousands, as found by Gauss and Goldschmidt [19]. With the Definitive Theorem now though we get a much better estimate of π (*x*) than any other to date. Beginning from (41) we can move in the direction of the Hypothesis with the precise values of *Li* (*x*) now with the *i* divided out, leaving a real function, in order to solve for the error term.

With absolute precision, calculating all the values of the function this far, one can find where our *o* (*x*) from (32) fits nicely into the following:

$$\pi (x) - Li (x) = x^{\frac{1}{2} + o} \tag{43}$$

Of course we can do this by restricting any amount of change into the variable *o*. Rearranging, and assuming, for the time being, that *o* is the same variable as before, we can perform the following to solve for *o*:

$$x^{o} = \frac{\pi (x) - Li (x)}{x^{\frac{1}{2}}} \tag{44}$$

$$o \log(x) = \log((\pi(x) - \mathrm{Li}(x))(x^{½})^{-1}) \tag{45}$$

$$o = \log((\pi(x) - Li(x))(x^{½})^{-1})(\log(x))^{-1} \tag{46}$$

Thus, taking (31) in account, we now have two methods of solving for the function $o(x)$, (46) being the easier of course, provided we have counted $\pi(x)$ and calculated $Li(x)$ up to the values we need. Solving for (32 & 45), we see that they are precisely equal from the second value to the infinite. The first value of $o(x)$ requires a bit of explaining, though with an intriguing revelation. Since the subtraction of $\pi(1) - Li(1) = \log(-1) / \log(2)$ or $\pi i / \log(2)$, and any value of $o(x)$ in $x^{½ + o}$ when $x = 1$ will always = 1, we can conclude the following when $x = 1$, $\pi(1) = 0$, $Li(1) = \log(-1)(\log(2))^{-1}$, $o \log(1) = 0$, and,

$$\log((0 - \log(-1))(\log(2))^{-1}(x^{½})^{-1}) = 0 \tag{47}$$

And since the only number whose log = 0 is 1, one can rightfully say when $x = 1$,

$$(0 - \log(-1))(\log(2))^{-1}(x^{½})^{-1} = 1 \tag{48}$$

Since this is true, the numerator of (44) must = the denominator, as any number divided by itself = 1. Thus,

$$\frac{0 - \log(-1)}{\log(2)} = x^{½} \tag{49}$$

And since any positive number subtracted from zero is a negative value, $\pi i = \log(-1)$. And log (2) is just another way of saying $\log(x + 1)$ when $x = 1$, we can state the following:

$$\frac{-\pi i}{\log(x+1)} = x^{½} \tag{50}$$

Thus, the negative counterpart of $Li(x)$ times y, which again is approximately 1 at its first value, as one can see comparing (50) with (42), is the Square Root Function of all the natural numbers, as $x^{½} = Sqrt\ \{x\}$. And one can see a strikingly similar behavior with the graph above of $Li\ (x)$ with that of the Square Root Function below.

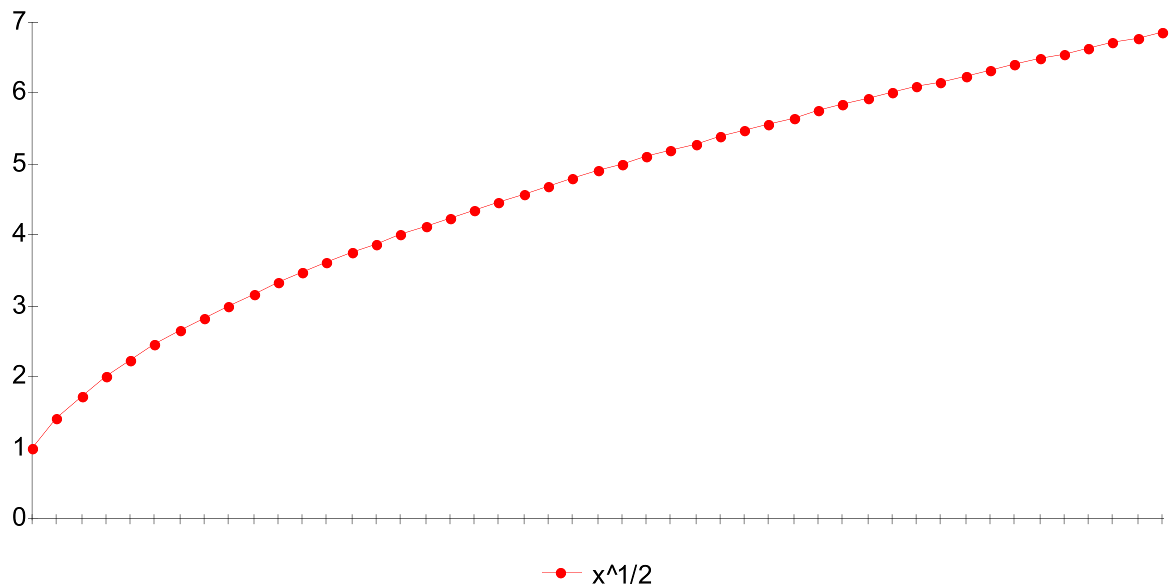

FIGURE 10 The Square Root Function

Indeed, the Prime Counting Function has some relationship with the Square Root Function, as they appear to negative counterparts with some error term ε, at least so far from this approach. In any case, now we can move forward into the realm of Mertens' Function, as all requirements for what follows have been presented.

The Depth of Mertens' Function

Mertens' Function $M\ (k)$ is the sum of the Möbius function $\mu\ (n)$, perhaps first discovered by Meissel [25]. The definitions of $\mu\ (n)$ are as follows for the natural numbers: the number 1 gets a 1, any number n a product of an even number of primes gets a 1 also, any prime number or the product of an odd number of primes gets a –1 and any number having a square factor gets a 0 [1]. Starting at $\mu\ (1)$, we get: 1, -1, -1, 0, -1, etc. And this function does have a very close relationship with the Zeta Function, of which can be seen in the following [1]:

$$\frac{1}{\zeta (s)} = \sum_{n=1}^{\infty} \frac{\mu (n)}{n^s} \tag{51}$$

Where s is the complex number whose real part is hypothesized to be ½ for all the zeros of the Zeta Function.

In order to move in the direction of (3), in order to eventually solve for ε and the constant in the equation, we can first impart the following in the same as we have in order to bring their difference closer together:

$$M (x) = x^{\frac{1}{2} + v} \tag{52}$$

Where any amount of change can be restricted to v, and Mertens' Function is now referred to as $M (x)$. One can then let v be a two-part real function $v (x)$ for each value of the function equal to $o + p$, where o is from (31 & 45), thereby restricting any amount of change to p.

$$M (x) = x^{\frac{1}{2} + o + p} \tag{53}$$

Thus, knowing $\pi (x)$, $Li (x)$ and $M (x)$, we can solve for p (1) to ∞, as o can be solved simply by knowing $\pi (x)$ and $Li (x)$, as shown earlier. Therefore,

$$p (x) = \log (M (x)(x^{\frac{1}{2} + o})^{-1})(\log (x))^{-1} \tag{54}$$

Since we know with absolute certainty the values of $o (x)$ and $M (x)$, we can solve and graph $p (x)$ in relationship with $o (x)$, starting from the third, as the first two are considerably larger than what follows and are not as pretty to graph alongside the rest.

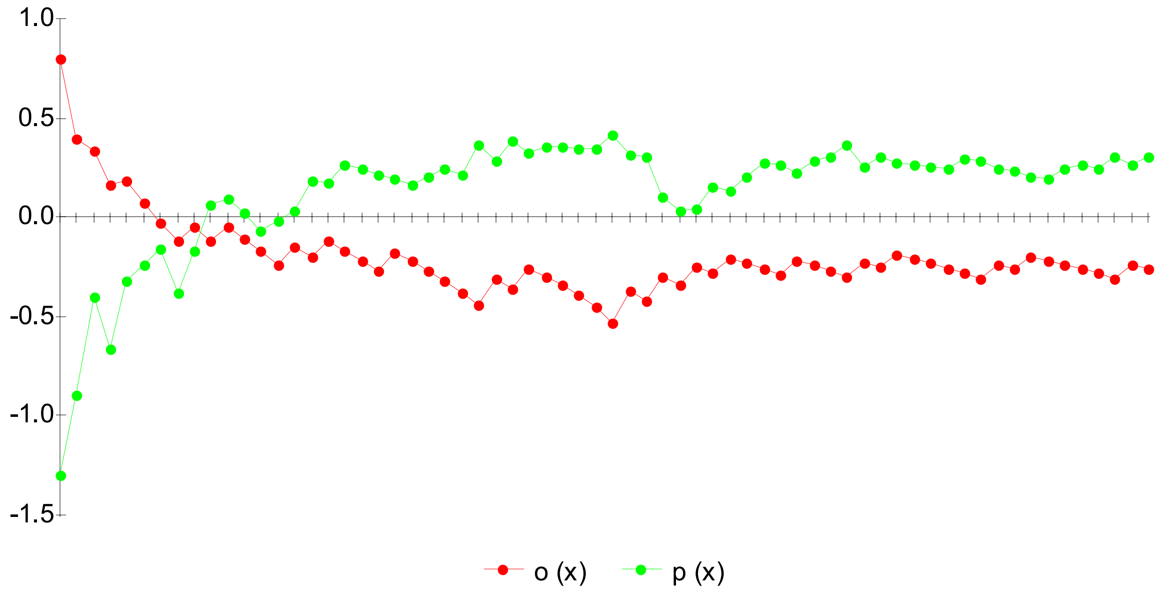

FIGURE 11 The functions $o\ (x)$ & $p\ (x)$

And taking both $o\ (x)$ and $p\ (x)$ to infinity, one finds that both are O (½) and obviously that one is the counterpart of the other to some close extent, as taking the sum of $o\ (x) + p\ (x) \rightarrow$ infinity equals zero. Thus, $v\ (x)$ converges at zero, thereby bringing $M\ (x) \sim x^{½}$, becoming more accurate as one calculates forward [6].

Now to continue, we can solve for $v\ (x)$, using the following rearrangement of (52):

$$v\ (x) = \frac{\log\ (M\ (x)(x^{½})^{-1})}{\log\ (x)} \tag{55}$$

We get the following first seven values of this function.

TABLE 14

x	$v\ (x)$
1	0
2	-1022.6…
3	-½
4	-½
5	-.6932…
6	-½
7	-.1437…

A sub-series in v (x), that is when x = 1, 3, 4, 6, 10, 16, 64… etc., shows a diminishing pattern that eventually leads to zeros, v (64) being the first zero, where o (x) and p (x) are exact counterparts of each other in such cases. It can also be concluded that because the first value of Mertens' function is 1, the first value of v (x) must be 0, as it is the only number that will allow (52) to be true. And while the spacing of these zeros spreads out exponentially as v (x) → infinity, the following connection to Theorems 1, the Definitive & 3 will show that there are an infinite number of these zeros, each bringing o (x) and p (x) closer together to make $M\ (x) \sim x^{½}$, and therefore closer and closer to the Square Root Function, the negative counterpart of Li (x).

In order to better understand the function, we can define the pattern with the Neutronic Function. To get this lined up in an entirely positive context, as was done earlier for ρo (x) we must perform the following for ρv, the seemingly random fluctuations of Mertens' Function:

$$\rho v = \frac{1}{v^2} \tag{56}$$

Thus, the first seven values of ρv (x) are as follows:

TABLE 15

x	$\rho v\ (x)$
1	Undefined
2	9.56287 X 10^-7
3	4
4	4
5	208.08452
6	4
7	48.36438

Then we can separate the values into their integer and real parts.

TABLE 16

x	*Int* (ρm)	*Re* (ρm)
1	Undefined	Undefined
2	0	9.56287 X 10^-7
3	4	0
4	4	0
5	208	.08452
6	4	0
7	48	.36438

Thereby leaving the real part = O (*4*). We can then divide all the integer parts by 4 in order to control the growth of the Neutronic Function, as was done in our earlier example.

TABLE 17

x	*Int* (ρm)
1	Undefined
2	0
3	1
4	1
5	52
6	1
7	12

Which are the values of the same pattern we used earlier to prove the Definitive Neutronic Theorem. Lastly, before presenting the first part of the proof of the Riemann Hypothesis, I would like to add one final observation of Mertens' Function. Taking dv_ξ, from the Neutronic Function built from *Int* (ρ*v*) above up to infinity reveals an interesting result: the values of *bv* (x) converge to $dv_\xi + 1 / (x - 2)$. For instance, if we set $dv_\xi = 200$, we get the first seven values rounded to three decimal places:

TABLE 18

x	Argument	*b* (*x*)
1	N / A	Undefined
2	Any Argument	Any Value
3	≈ 200 + 1 / (3 – 2)	201
4	≈ 200 + 1 / (4 – 2)	200.501
5	≈ 200 + 1 / (5 – 2)	200.335
6	≈ 200 + 1 / (6 – 2)	200.251
7	≈ 200 + 1 / (7 – 2)	200.201

And if we set $dv_\xi = 2{,}000$, we get the following rounded to four decimal places:

TABLE 19

x	Argument	*b* (*x*)
1	N / A	Undefined
2	Any Argument	Any Value
3	≈ 2000 + 1 / (3 – 2)	2001
4	≈ 2000 + 1 / (4 – 2)	2000.5003
5	≈ 2000 + 1 / (5 – 2)	2000.3334
6	≈ 2000 + 1 / (6 – 2)	2000.2501
7	≈ 2000 + 1 / (7 – 2)	2000.2001

We see that as dv_ξ increases, *bv* (*x*) becomes more and more ~ $dv_\xi + 1 / (x - 2)$. Taking the function → ∞, we can say that *bv* (*x*) for *Int* (ρ*v*) of Mertens' Function is as follows:

$$dv_\xi + \frac{1}{x-2} = O\,(bv_x) \qquad (57)$$

Which puts an incredibly tight bound on $bv(x)$. Connecting this relationship with all the preceding points helps shed brighter light on the function, which has otherwise been shadowed in mystery, other than the fact that it grows infinitely larger. Putting all of the above equations together gives greater definition to this relationship between the distribution of prime numbers and $M(x)$.

Proof that the Riemann Hypothesis is True

While we have bordered close on proving the Hypothesis already, suggesting that both the real parts $v(x) = O(½)$, that the limit of $M(x) = x^{½}$, which is the negative counterpart of $Li(x)$, suggesting the direct relationship in equations (2 & 3), we have not directly connected the proof entirely to the theorems. While much detail was provided in the sections before, this section will be the simplest of them all, as this is based on all of the previous propositions, which are valid propositions, as they are both affirmative and either particular or universal respectively [3].

To begin, consider the inverse of $v(x)$. Then take in (55) to bring about the comparison, knowing that $M(x)$ when solving for (55) requires the log of a great deal of negative numbers, as much of Mertens' is in the red. So we get undefined values for the inverse of $v(1)$, as $v(1) = 0$. We know that the second value ≈ -1022.6. Therefore the inverse of that ≈ -.000977. We can take that value times πyi to get $v(1)$, which ≈ .00307. Therefore, we get the following first seven values for the inverse of $v(x)$:

TABLE 20

x	$1 / v(x)$
1	.00307
2	-.00097
3	-2
4	-2
5	-14.42513
6	-2
7	-6.95445

Then we can solve for $yi(x)$, as was done in (36), as $v(1)$ above is simply $\pi yi \cdot v(2)$:

$$yi(x) = \frac{v_x}{\pi v_{x-1}} \tag{58}$$

We then get the following values for yi (x):

TABLE 21

x	yi (x)
1	0
2	-1
3	.00015
4	$1 / \pi$
5	.04413
6	2.29583
7	.09154

Which allows us to see that as Mertens' Function increases, yi (x) converges once again to the inverse of π. This was explained earlier, but just to recap, the reason this happens is because any value in the equation other than 1 / π grows infinitely smaller, leaving only 1 / π behind. Therefore,

$$\frac{1}{\pi} = O\ (yi_x) \tag{59}$$

And considering the limit,

$$yi\ (x) = O\ (1) \tag{60}$$

Since eventually all values of yi (x) will be below 1, we can subtract yi (x) from any value > 1 and ascertain that all values will be positive as $x \to \infty$. However, there is one value that will contain all yi (x) and is a tight bound: the inverse of the limit, which is π. Now we can impart our next periodic function ρyi (x), which happens to have, due to above Theorems, a defined limit and a ρ_{max}.

$$\rho yi\ (x) = \pi - yi_x \tag{61}$$

Thus, separated ρyi (x) into an integer and real part, we get the following:

TABLE 22

x	*Int* (ρyi)	*Re* (ρyi)
1	2	1.14159
2	4	1.14159
3	2	1.14143
4	2	.82328
5	2	1.09745
6	0	.84576
7	2	1.05005

Suffice to say, these integer and real part functions converge rather quickly and reveal the following in no time:

$$Int\ (\rho yi) = O\ (4) \tag{62}$$

$$Re\ (\rho yi) = O\ (2) \tag{63}$$

Which makes it justifiable to factually say, after adding (62 & 63), considering (61) and that big oh is irrespective of signs, the increments of the bounding function = π + 6. Where the constant in the big oh part is simply ± 1 (1, because we are speaking of *i*, whose square = Sqrt {-1}). Beginning the two functions from the same value and then simply adding (π + 6) to each of the previous to solve for the next of our big oh part, we get,

$$\mathrm{E}\ (x) = \sum_{x=1}^{xn} (x-1)(\pi + 6) \tag{64}$$

This function is the absolute tightest bound for the inverse of v (x). Graphing this function beside the inverse function of v (x) makes things considerably clearer.

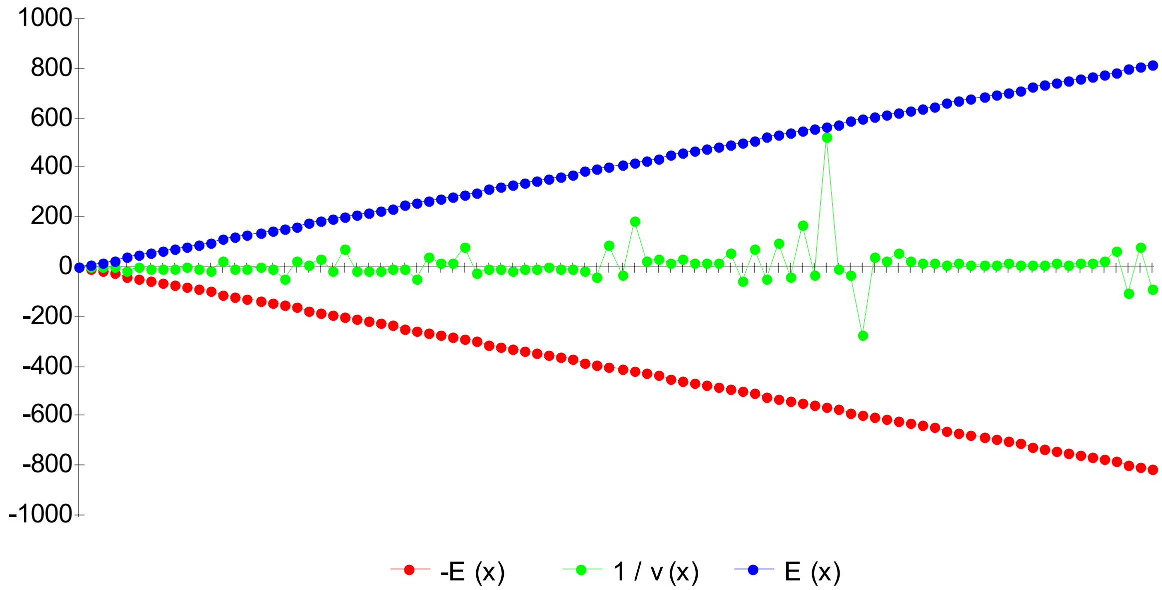

FIGURE 12 1 / v (x) is big oh of E (x)

And now we can bring E (x) into Mertens' equation by rearranging all the equations presented above. Now, because all values of E $(x) > 1 / v(x)$, even though the relationship is intimately linked, considering (64), the following equation must contain some constant > 1 to be considered true:

$$M(x) = O\left(x^{\frac{1}{2} + 1 / \mathrm{E}(x)}\right) \tag{65}$$

$M(x) / x^{\frac{1}{2} + \varepsilon}$ can give us the values of another periodic function $\rho e(x)$ that leads to the constant in (3), where ε is the error term of the following:

$$x^{\frac{1}{2}} \log(x) = x^{\frac{1}{2} + \varepsilon} \tag{66}$$

$$\rho e(x) = \frac{M(x)}{x^{\frac{1}{2} + \varepsilon}} \tag{67}$$

Since $\rho e(x)$ contains all the values of the ratio, as (67) is simply a rearrangement of the hypothesized (3), de_{ξ} will be the constant > *1* in the tightest possible bound of our big oh proof. Since $\rho e\,(x)$ is convergent, as solving for ε in (67) is convergent, providing us with a defined limit, de_ξ is simply $\rho e_{max} + 1$. And what is the largest value of $\rho e\,(x)$ irrespective of its sign?

TABLE 23

x	$\rho e\,(x)$
1	1
2	0
3	-.52553
4	-.36067
5	-.55574
6	-.22785
7	-.38847

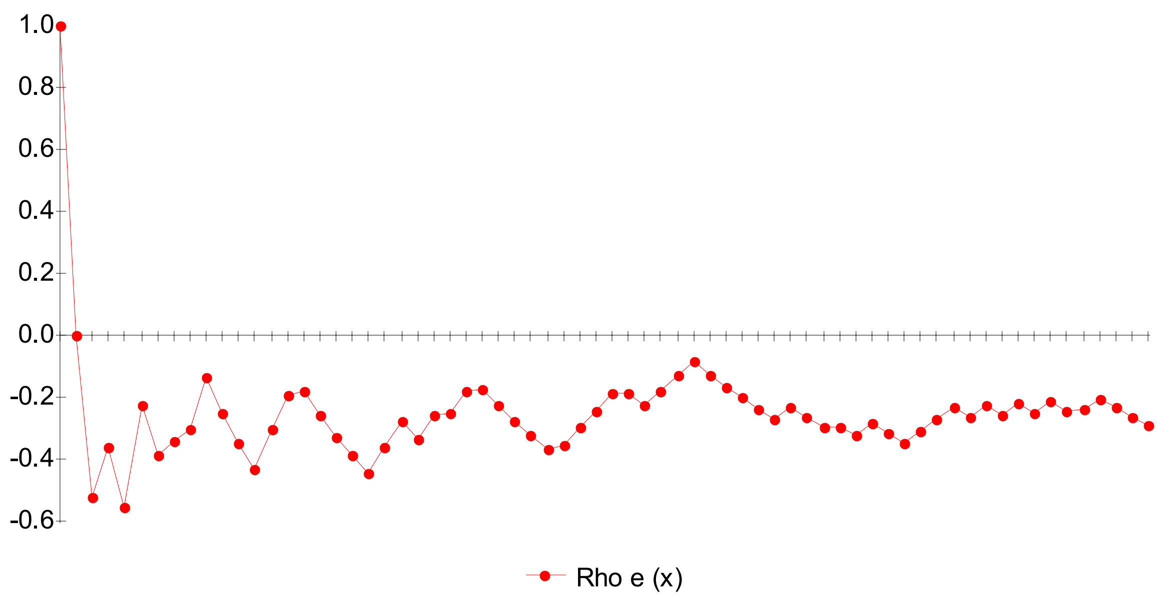

FIGURE 13 The function $\rho e\,(x)$

It is 1. Therefore, $de_\xi = 2$, which is the integer $= \rho e_{max} + 1$. Thus, our constant in (3) = 2, which, as estimated by Mertens, any value cannot be greater than 2 as $\rho \to 0$ [24], as its inverse is ½. We can now clearly understand the following:

$$M\,(x) < 2x^{\frac{1}{2} + 1\,/\,E\,(x)} \tag{68}$$

Considering the right hand side of (68), a function of its own, which we can refer to simply as P (x),

$$P(x) = 2x^{\frac{1}{2} + 1 / E(x)} \tag{69}$$

We get the following values:

TABLE 24

x	P (x)
1	2
2	3.05115
3	3.67860
4	4.20737
5	4.67335
6	5.09482
7	5.48259

Graphing these, the above and its negative counterpart, around Mertens' Function, we get:

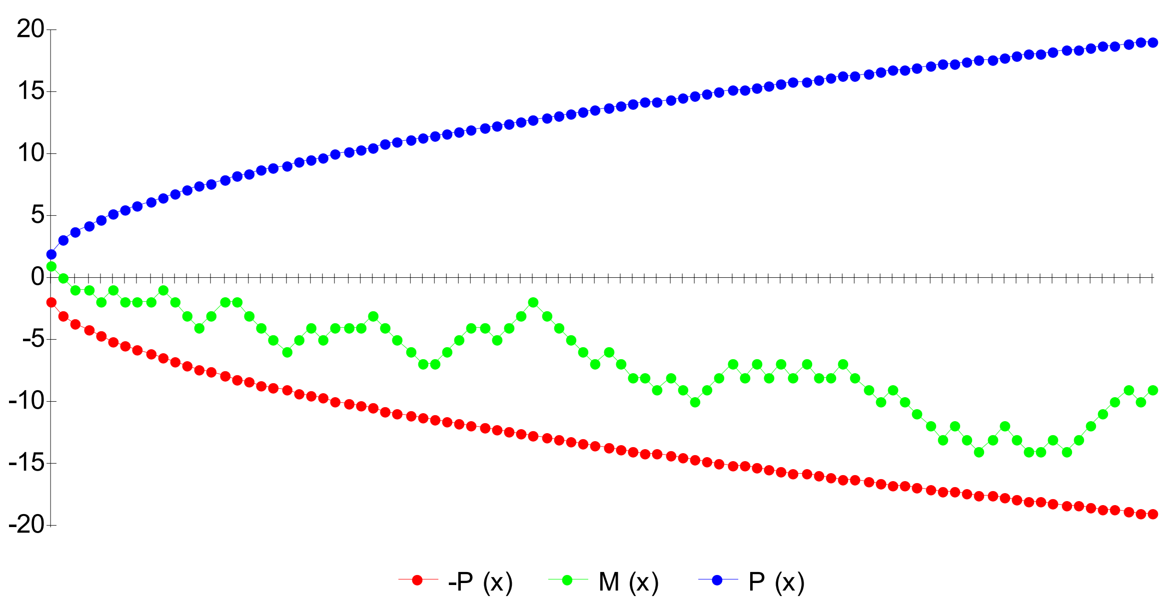

FIGURE 14 M (x) is big oh of P (x)

Thus, as one recognizes,

$$2x^{\frac{1}{2} + 1 / \mathrm{E}(x)} \sim 2x^{\frac{1}{2}} \tag{70}$$

Where the second half of the equation is 2 multiplied by the Square Root Function, which is the negative counterpart of $Li\ (x)$. The above is more than just a tight approximation, as their first values are exactly equal (both = 2), and their 90th, for instance, $2 \cdot 90^{\frac{1}{2}} \approx 18.973$ and $\mathrm{P}(90) \approx 19.078$. Since $\mathrm{P}(x)$ will always be $> 2x^{1/2}$ anywhere after their first value, and the difference goes to zero as $x \to \infty$, there is a limit that is finite and neither function begins with zero [2]. Hence, the following are true, regarding ε from (3):

$$\varepsilon = \frac{1}{\mathrm{E}(x)} \tag{71}$$

$$M(x) = O(x^{\frac{1}{2} + 1 / \mathrm{E}(x)}) \tag{72}$$

And therefore, by means of inclusion of the entirety of $M(x)$ bounding of $O(x)$, the von Koch relationship between (3) and the zeros of the Zeta Function, the Riemann Hypothesis is true. All the non-trivial zeros do have a Real part ½.

While most researchers of the Riemann Hypothesis have their own preconceived notions of what a proof might look like, many, if not most, would say that what was just presented is not like what they had in mind at all. In fact, it would be likely with a proof as important as a Riemann Hypothesis that what I have put forward may even come up short in many minds; though, according to all definitions by mathematicians set before me, it actually is valid. It just may not seem satisfying enough for one to stake their reputation on it in accepting it. It is then my intention to continue forward and re-prove it in a way that fit many others' expectations, which can now be done with all that has been shown so far. Thus, what follows is the second part of the proof.

The Order of the Primes

One of the earliest discoveries of prime numbers is the fact that all primes > 3 are either 1 or 5 in m mod 6. This 6 and the minus 1 in equation (64) indeed are quite important in all that follows, which is the second part of this Riemann Hypothesis proof. Firstly, I have classified all numbers that are either prime or a product of primes > 3 as either Alpha Numbers, which = 5 in m mod 6 or Beta Numbers, which = 1 in m mod 6. All Alpha numbers that are prime are referred to as Alpha Primes and all Beta Numbers that are prime are simply Beta Primes.

The exceptions are called either Alpha Q's (Q_α) or Beta Q's (Q_β). All of these Q's are products of primes > 3. However, Alpha Q's are a bit different from Beta Q's it turns out. Alpha Q's are products of both Alpha Primes and Beta Primes, while Beta Q's are only products of either Alpha numbers or Beta numbers. For instance, 35 is an Alpha Q, as it contains both an Alpha Prime and a Beta Prime, 5 & 7. 25 is a Beta Q, as it only contains 5 & 5. Thus, 175 is also a Beta prime as it contains two Beta Q's, 25 & 7. So, any Q that is a power > 1 of a prime number is always a Beta Q and takes higher precedence than this classification of prime numbers themselves.

TABLE 25

$Q\alpha$	$Q\beta$
5	7
11	13
17	19
23	25
29	31
35	37
41	43
47	49
53	55

The Q's follow very simple and predictable growth and the primes simply fill in the empty places of our linear graph we could make from the table above. For instance, all the Alpha Q's whose lowest prime is 5 always increases by 30. The first is $35 = 5 + 30 = 5 + (5 \cdot 6) = 5 \cdot 7$, the next is $65 = 35 + 30 = 35 + (5 \cdot 6) = 5 \cdot 13$, the next is $95 = 65 + 30 = 65 + (5 \cdot 6) = 5 \cdot 19$ and so on. For the next whose lowest prime is 11, those Q's increase by 66 or $11 \cdot 6$. For 17, they increase by 102 or $17 \cdot 6$. And that is basically it for the Alpha Qs; the rest follow the same process. The same occurs for the Beta Q's. For 7, each increase is by 42 or $7 \cdot 6$. The next increases by 78 or $13 \cdot 6$. While this is a very good description of where they are and why the primes in between progress the way they do, it is a somewhat complicated way of looking at it. It can be simplified by giving each Alpha or Beta number, Q's or primes, a corresponding integer to graph with. For Alpha Numbers I have chosen a capital Y and Beta Numbers I have chosen a capital X. The correspondents can be calculated as follows:

$$Y = \frac{(\alpha + 1)}{6} \qquad (73)$$

$$X = \frac{(\beta - 1)}{6} \tag{74}$$

Which brings in our 1 and 6 from equations (64). So, for all primes and Q's a corresponding real integer is its unique partner. And for any integer from 1 to infinity, either an Alpha Number or Beta Number can easily be calculated. But to differentiate further, Q's have a unique correspondent, which I call simply C_α or C_β with a capital C.

$$C_\alpha = \frac{(Q_\alpha + 1)}{6} \tag{75}$$

$$C_\beta = \frac{(Q_b + 1)}{6} \tag{76}$$

So one can further fulfill a proof of the following definition for Alpha Primes and Beta Primes.

$$C_\alpha \subseteq Y \tag{77}$$

$$\Pi_\alpha \in (6Y - 1) \ \forall \ Y = \{1, 2, 3\ldots\} \notin C_\alpha \tag{78}$$

Where all Alpha Primes are contained in the set of any integer value of Y in $6Y - 1$ except those that are Q_α correspondents. The similar goes for Beta Primes.

$$C_\beta \subseteq X \tag{79}$$

$$\Pi_\beta \in (6X + 1) \ \forall \ X = \{1, 2, 3\ldots\} \notin C_\beta \tag{80}$$

Where all Beta Primes are contained in the set of any integer value of X in $6X + 1$ with the exception of Q_β correspondents. And this grouping is essential for the growth of the primes, else there would be no non-trivial zeros of the Zeta Function, as the oscillations of Riemann's second term of $J(x)$, what he called the Periodic Term, which is the sum of $Li(x^\rho)$, where Rho in this equation are the roots, the zeros of the Zeta Function, would not gradually decrease to zero; they would so called fall out of tune. In the next section, I will provide the means to calculate a function that is asymptotically equal to $\Pi(x)$, to show this in detail, along with results from the Neutronic Function and Definitive Theorem earlier presented. The same will then be shown for a function that calculates the non-trivial zeros of the Zeta Function to infinity based on $\Pi(x)$. This growth and containment of all the prime numbers of this past section is crucial in understanding what is to follow.

The Prime Number Function

To best understand my expression, 'fall out of tune,' in the last section, some very simple music mathematics is in order. The containment of the primes in (78) & (80) can be musically expressed stating that they fall into a sexatonic musical scale (hence the mod 6 element, *sex* referring of course to 6). So if we wanted to go up the scale of primes in the sexatonic scale in the key of *A*, 2 = *A* –2, 3 = *Bb* –1, 5 = *C* –1, 7 = *D* –1, 11 = *Gb* –1, 13 = *Ab* –1, 17 = *C*0, 19 = *D*0 and so on (considering those notes to be the lowest possible notes of a scale), spreading further and further apart, but never leaving the scale, which in the key of *A* includes only the six notes, *A, Bb, C, D, Gb* & *Ab*. All primes in this scale will only ever be those numbers according to (78) & (80). Firstly, I should remark that if any reader has been skeptical thus far, he or she will not easily dismiss this coming second part of a Riemann Hypothesis proof, as I will prove the hypothesis true from a different angle with some interesting results. However, I will be revealing the next functions rather sparsely to save room in this paper for the proof and results at hand.

If one chooses any measurement of time and distance so that the note *A* –2 has a known frequency, provided also you know the speed of sound in this measurement, one could graph the values of the growth of the frequency for all the prime numbers, which I will not need to do however to save room for further results. The important point being here that the musical notes increase by the value of $2^{1/12}$ times the previous note. This 2, the inverse of course is ½ and the 1/12 will become quite important for what will come next with the Prime Number Function and the non-trivial zeros.

The Prime Number Function's values are simply all the prime numbers in order as they appear on a number line.

$$\Pi(x) = 2, 3, 5, 7, 11, 13, 17\ldots \tag{81}$$

Using the Neutronic Equations and the theorems presented thus far, a very similar function to Π (x), which is ϑ (x), can be calculated. The first functional term of ϑ (x) is extremely straightforward and needs no explanation; it is as follows:

$$r(x) = \frac{4x}{5} - 15 \tag{82}$$

TABLE 26

x	$r(x)$
1	-14.2
2	-13.4
3	-12.6
4	-11.8
5	-11
6	-10.2
7	-9.4
8	-8.6
9	-7.8

The second functional term of ϑ (x) is a combination of equation (74) and the Neutronic Functions, as well as an implementation of the Definitive Theorem.

$$u(x) = \log(-\pi \cdot \beta(x) \cdot \mathrm{A}(x)) \tag{83}$$

Where β (x) is simply the corresponding Beta number for whatever x is; it is merely a rearrangement of (74). A (x), using the Greek A, is as follows:

$$\mathrm{A}(x) = 1 - 6x^x \tag{84}$$

All of the values of A (x) equal a negative Alpha number. The Beta counterpart of this function is B (x), using a Greek B.

$$\mathrm{B}(x) = -1 - 6x^x \tag{85}$$

Where all values of B (x) are negative Beta Numbers; though, B (x) is not really used as any part of ϑ (x); only A (x) is. The actual terms of ϑ (x) then are as follows:

$$\vartheta (x) = r (x) + u (x) \tag{86}$$

TABLE 27

x	ϑ (x)
1	-9.34169…
2	-6.515477…
3	-3.423559…
4	-.099483…
5	3.417664…
6	7.09796…
7	10.91906…
8	14.86384…
9	18.91884…

Graphing ϑ (x) alongside Π (x) up to x = 140 demonstrates their similarity.

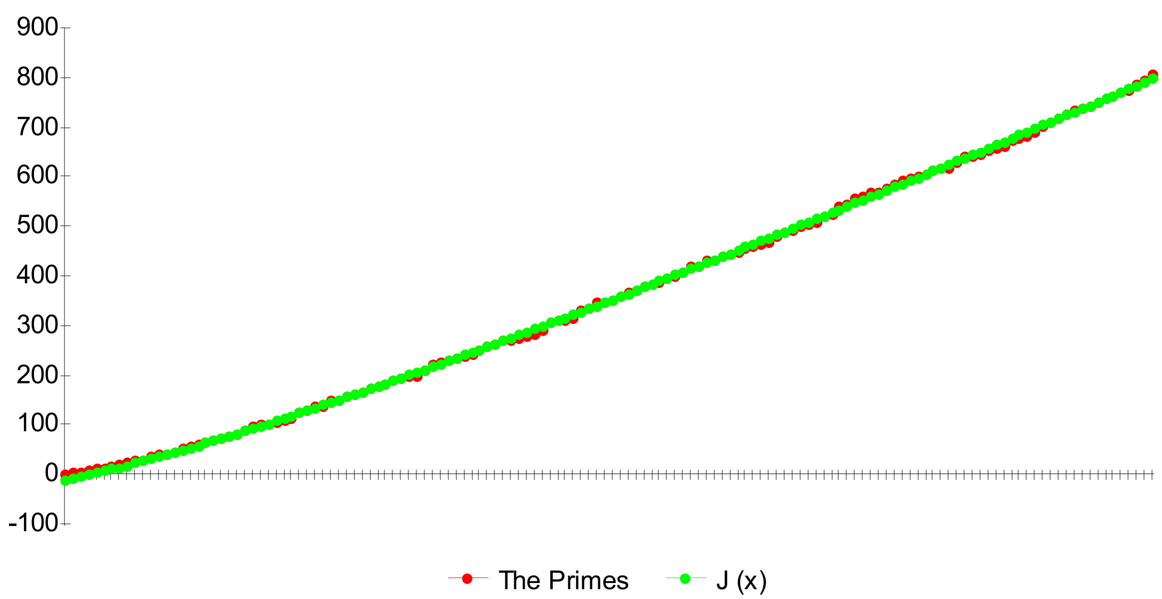

FIGURE 15 The functions Π (x) & ϑ (x)

In fact, using the following equation, the sum of their difference to infinity goes to zero:

$$Err\,(\vartheta) = \sum_{x=1}^{\infty} \vartheta\,(x) - \Pi\,(x) = 0 \qquad (87)$$

Furthermore, the maximum value of all error terms from 1 to infinity becomes very clearly the following:

$$\vartheta\,(x) - \Pi\,(x) = O\,(12) \qquad (88)$$

This accounts for the maximum positive value to be < 12 and the minimum negative value to be > -12, which allows the function to stay comfortably in tune for the following to be true.

$$\vartheta\,(x) \sim \Pi\,(x) \qquad (89)$$

The Non-Trivial Zero Function

The Non-Trivial Zero Function is in reality simply the imaginary parts of the Zeta Function's non-trivial zeros divided by *i*, a sequence of real numbers.

$$t\,(x) = 14.1347\ldots, 21.022\ldots, 25.0109\ldots \qquad (90)$$

Using the $\vartheta\,(x)$ function along with Neutronics, the approximate function T (x) can be calculated as well, in fact, it becomes even more similar to it than $\vartheta\,(x)$ is to $\Pi\,(x)$. But instead of using the constant 1, such as in (73) & (74), I use the first value of $t\,(x)$ which is ≈ 14.1347251. The first element is the following function, which was also derived using the earlier theorems:

$$l\,(x) = \frac{x}{6t_1 - 1} + \frac{1}{(6t_1 \bmod 6) + 2} + 8 \qquad (91)$$

Where t_1 is the value ≈ 14.1347251. Combining $l\ (x)$ with $\vartheta\ (x)$ in the following arrangement, we get $a\ (x)$ as:

$$a\ (x) = (l\ (x) \cdot \vartheta\ (x)^{½}) + \log\ (\vartheta\ (x)) - \frac{1}{6\ \vartheta\ (x)} + \vartheta\ (x)^{½} + 6 \tag{92}$$

Then there is one last part of the first term of T (x).

$$j\ (x) = 1 + \frac{1}{x} \tag{93}$$

Which is rather straightforward to say the least. Thus, T (x) is the combination of all this in the following arrangement:

$$\mathrm{T}\ (x) = j\ (x) \cdot a\ (x) - 20 + \frac{1}{2} \tag{94}$$

TABLE 28

x	T (x)
1	Undefined
2	Undefined
3	Undefined
4	Undefined
5	8.750997…
6	17.70741…
7	24.28860…
8	29.77226…
9	34.60735…

While, the first four values could be defined using the Definitive Theorem, as have the rest so far, it is not terribly important for the further purposes of this paper, as this function closely becomes especially similar to $t\ (x)$ rather quickly.

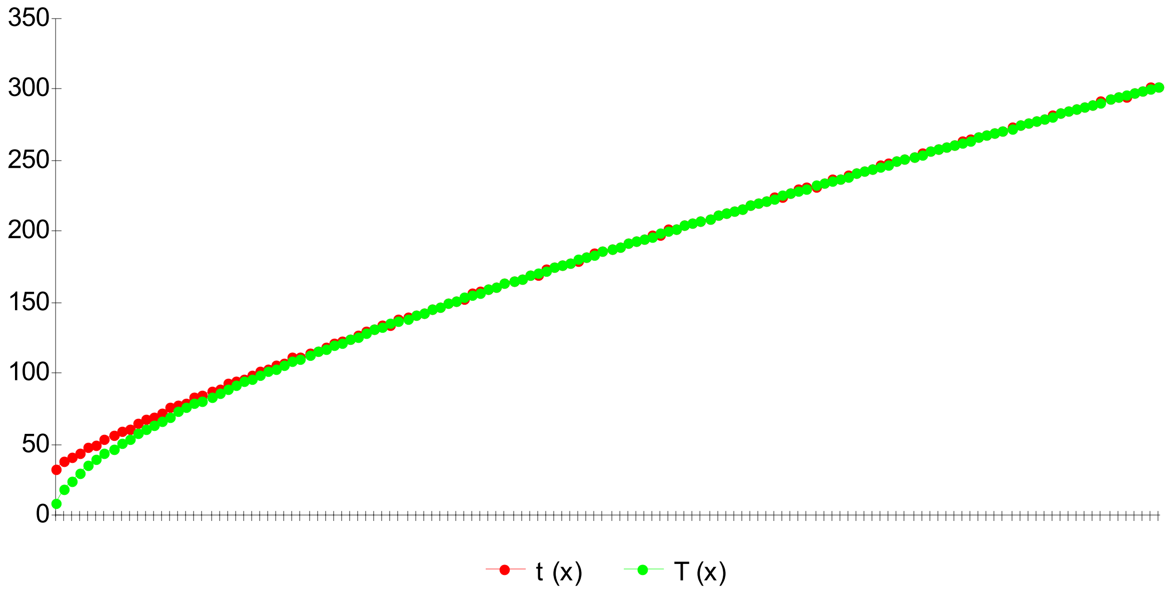

FIGURE 16 The functions t (x) & T (x)

And in the same, the sum of all the error terms between the two also is zero.

$$Err\ (\mathrm{T}) = \sum_{X=1}^{\infty} \ t\ (x) - \mathrm{T}\ (x)\ = 0 \tag{95}$$

$$t\ (x) - \mathrm{T}\ (x) = O\ (2) \tag{96}$$

$$t\ (x) \sim \mathrm{T}\ (x) \tag{97}$$

The Neutronic Zeta Function

Neutronics moved things forward thus far, but it becomes absolutely necessary for the reader to see how the Zeta Function goes to zero using T (x) for it to be a wholly acceptable proof according to mainstream mathematicians. No form of the Zeta Function to date could possibly integrate neutronic results, as their differences would blow up as one calculated forward. Therefore I will introduce another version of the Zeta Function that does indeed work for these purposes, as it to was derived using Neutronics itself. That version for a positive complex s begins with the following.

$$n = -1 \left(\frac{1}{2} + (Re\ (s) + Im\ (s) / i) \cdot \zeta\ (1 + \pi)\right) \tag{98}$$

Where $\zeta\ (1 + \pi)$ is a constant equal to 1.073… from the Zeta Function when $s = 1 + \pi$. The $Im\ (s) / i$ is simply 0 when using this equation to calculate positive real values of s. It is, however, important for clarification purposes when calculating the non-trivial zeros to understand this. Then this value n is used in the next equation.

$$y \sim 1 + \frac{1}{e^{-n}} + \frac{1}{55075} \tag{99}$$

In actuality, the first and third term are an average error term, hence the tilde sign. It can however be more precisely stated as the following:

$$y = \frac{1}{e^{-n}} + \varepsilon \tag{100}$$

Where ε here is a different identity from (2) & (3); I figured it was time to let go of that definition as I have since replaced it with the now a more precise function. The Neutronic Zeta Function then is as follows, which I denote with a capital Greek Z:

$$i\ \mathrm{Z}\ (s) = \frac{-\pi y i}{(1\text{-}2^{s})\ e^{(\log\ ((1+\pi)\ \exp\ (-s\ \log\ (2)\ -\ \varphi))\ +\ 1))}} \tag{101}$$

Where φ is a constant (1.276332…) equal to the following:

$$\varphi = \log\ \left(\frac{e + e\pi}{\pi}\right) \tag{102}$$

Where e is of course Euler's number. The imaginary i in (101) can be simply divided out for a real Zeta solution later. However, it is important to keep it there for proper definition due to the πi. It also will be important there when calculating the non-trivial zeros.

Graphing the values of the Zeta Function with a real s beginning at 2 is not as interesting as a table of both the Neutronic Zeta Function divided by i and the standard Zeta Function to five decimal places.

TABLE 29

s	Z (s)	ζ (s)
1	2.41476	Undefined
2	1.42788	1.64493
3	1.17056	1.20206
4	1.07551	1.08232
5	1.03518	1.03693
6	1.01686	1.01734
7	1.00821	1.00835
8	1.00404	1.00408
9	1.00200	1.00201
10	1.00099	1.00099
11	1.00049	1.00049

In other words, in no time it quickly becomes apparent that as s increases, they become asymptotically equal. This can be shown with the following.

$$Err\ (\mathrm{Z}) = \sum_{s=1}^{\infty} \zeta\ (s) - \mathrm{Z}\ (s) = 0 \tag{103}$$

$$\zeta\ (s) \sim \mathrm{Z}\ (s) \tag{104}$$

The Non-Trivial Zeros of the Neutronic Zeta Function

While no complex arithmetic has been shown so far, in order to calculate the non-trivial zeros with the Neutronic Zeta Function, it is now required. But first an important point must be noted. If the following is true:

$$e^{\pi i} = -1 \tag{105}$$

Leading to $\pi i = \log(-1)$, is there an identity as such for $2\pi i$? First start by squaring both sides of (105).

$$e^{2\pi i} = 1 \tag{106}$$

Then bring out the $2\pi i$ power.

$$2\pi i \log(e) = \log(1) \tag{107}$$

The log (e) part cancels and log (1) = 0. Thus,

$$2\pi i = 0 \tag{108}$$

The same goes for $-2\pi i$. They both equal zero. So it is this value that will be calculated for the non-trivial zeros, as we are already dealing with πi with the Definitive Theorem used thus far. While the Neutronic Zeta Function is not yet defined for negative real numbers, it works perfectly well for all positive real and complex values so long as all the complex values of s equal the same result.

For the real part of a complex Zeta value, one simply plugs the real and imaginary parts of s into (98) and then solves the same as for a Real number with a simple rearrangement of (101).

$$i\,Z(s) = \frac{-\pi y i}{(1-2^{s})\exp(\log((1+\pi)\cdot(e^{-s})^{\log(2)}\cdot(e^{\varphi})^{-1})+1)} \tag{109}$$

However, (98) has a catch when trying to solve for the imaginary part of the Zeta value; what values would one use for the second term within parentheses? For this he or she needs to introduce complex arithmetic. I will only define the non-trivial zeros in this paper, but really any functional arguments of the Neutronic Zeta Function can so be defined in a similar manner. First, in order to get from (98) to an equation that equals (98) for Complex values with an imaginary part >< $0i$, consider the following:

$$h\,(x) = \varpi\,(1 + (\frac{1}{e^{Re\,(g)}})) + \varepsilon) \tag{110}$$

Where ε is the same from (100). This equation is quite similar to (100) except the constant ϖ, which is really only a true constant when ε also is a fixed constant (the average error term), and lastly there is the addition of a 1 in (110). The Real part of *g* has yet to be defined, and I will hold off until I define the constant ϖ.

$$\varpi = \frac{2\pi\varepsilon - 2\varepsilon - \varepsilon\, 2^{1/2}}{-2 - \varepsilon} \tag{111}$$

Remember that ε is the fixed constant of the average error term. And this equation is only true when plugging an imaginary T (*x*) into the Neutronic Zeta Function, but will provide for a second constant required: the limit of *h* (*x*), which provides the following to be true.

$$\lim_{x \to \infty} h\,(x) = \frac{-Z\,(Im_s) \cdot \varepsilon}{i} \tag{112}$$

Where Z (Im_s) is the constant that the Imaginary part of *s* comes out to when plugging it into the Neutronic Zeta Function as *x* from T (*x*) → infinity. When plugging T (*x*) into the Zeta Function as the imaginary part of *s*, the following equation makes (112) true.

$$g\,(x) = \frac{\upsilon}{1 + x \cdot (6\,e^{(\mathrm{T}i\,(x)\,/\,1.5)})^{-1}} \tag{113}$$

Where T*i* (*x*) is simply *i* times T (*x*). Rearranging and reducing, considering the rules of Complex arithmetic, we can solve for the following so long as one understands that υ ≈.6254065, which will be explained in the paragraphs to come:

$$g\,(x) = Re\,(g) + Im\,(g) \tag{114}$$

Below are the first 11 values rounded to five decimal places.

TABLE 30

x	*Re* (*g*)	*Im* (*g*)
1	Undefined	Undefined
2	Undefined	Undefined
3	Undefined	Undefined
4	Undefined	Undefined
5	.34260	-.26651i
6	.31270	-.30655i
7	-.06845	-3.25799i
8	.25509	.01792i
9	.09993	-.79089i
10	.21883	.02916i
11	-.31820	-1.05925i

But the graphs of these parts give much better clarity as to what happens to them.

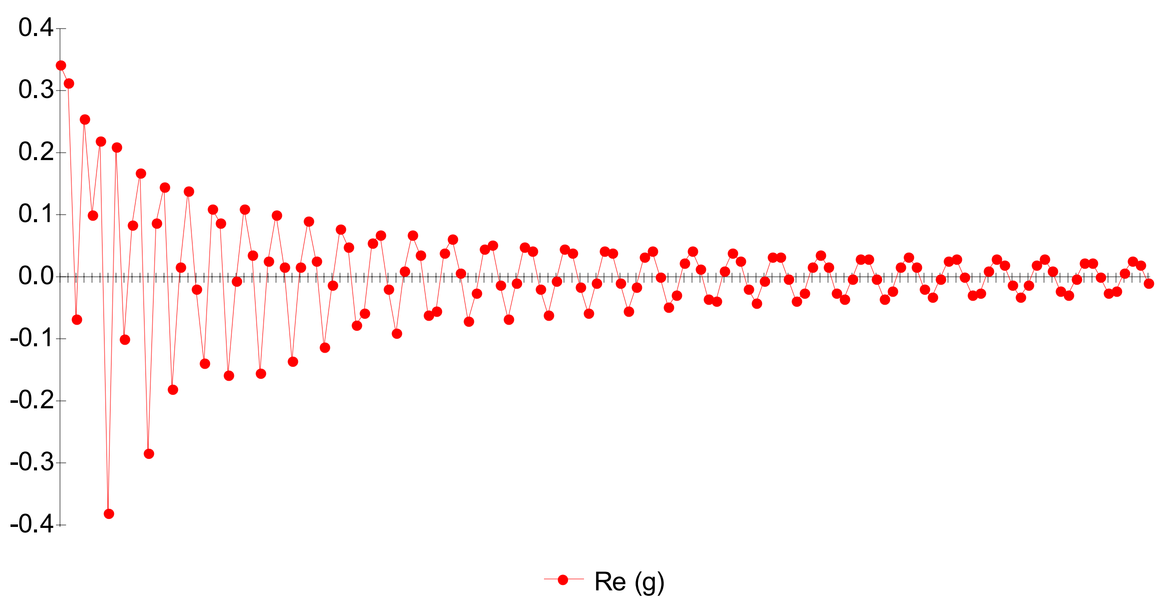

FIGURE 17 The real parts of *g* (*x*)

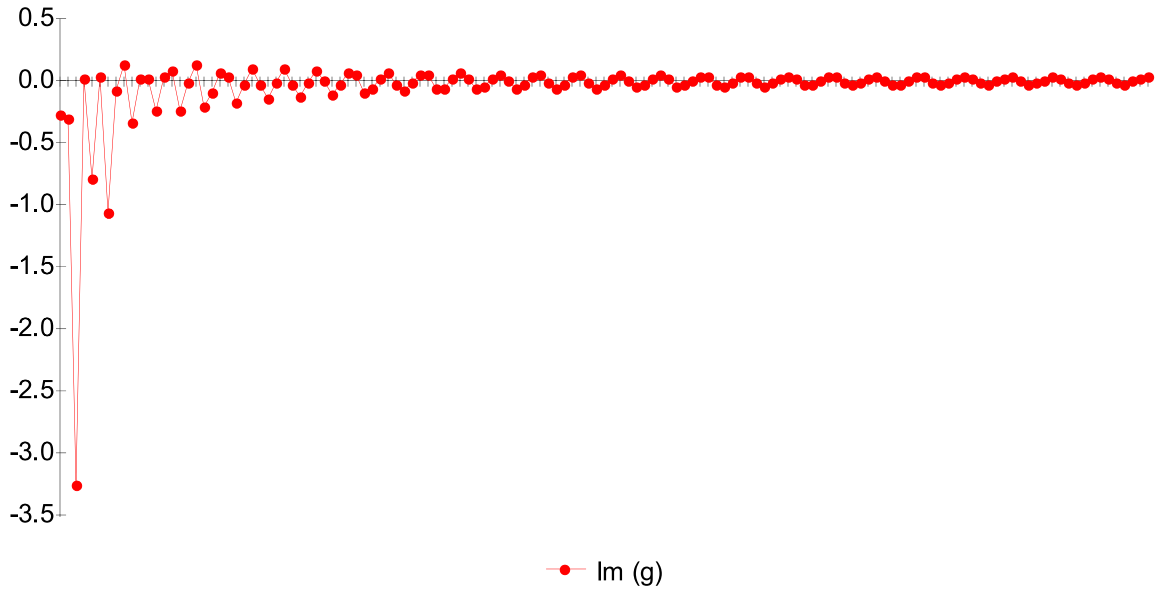

FIGURE 18 The imaginary parts of g (x)

They both go to zero as $x \to$ infinity.

Now, the next part about the constant υ may not be particularly obvious. But in order to use this to calculate y in (99), n must be constant if the value of the Neutronic Zeta Function will be constant as well for all values of s. In fact, n must equal υ. So, if we have the correct constant υ, the following will be true.

$$Re\ (g) = -1\ \left(\frac{1}{2} + (\mathrm{T}i\ (x) + c) \cdot \zeta\ (1 + \pi)\right)) \tag{115}$$

Which is quite a similar arrangement to n (x). In this case the second term can be solved for within the parentheses. Provided we have the correct value of υ, the following for a complex c will be true.

$$c\ (x) = (-Re\ (g) - \frac{1}{2} \cdot (\zeta\ (1 + \pi)))^{-1} + -\mathrm{T}i\ (x) \tag{116}$$

Where a negative Ti (x) is also the imaginary part of this function. And the real part is of course as follows:

$$Re\ (c) = (-Re\ (g) - \frac{1}{2} \cdot (\zeta\ (1 + \pi)))^{-1} \qquad (117)$$

In such case, the log of υ will be the constant that the real part of c converges too if one is to be able to use υ to calculate the imaginary part of the Neutronic Zeta Function.

$$\lim_{x \to \infty} Re\ (c) = \log\ (\upsilon) \qquad (118)$$

And indeed, this value is ≈.62540656, the same value we used in (113).

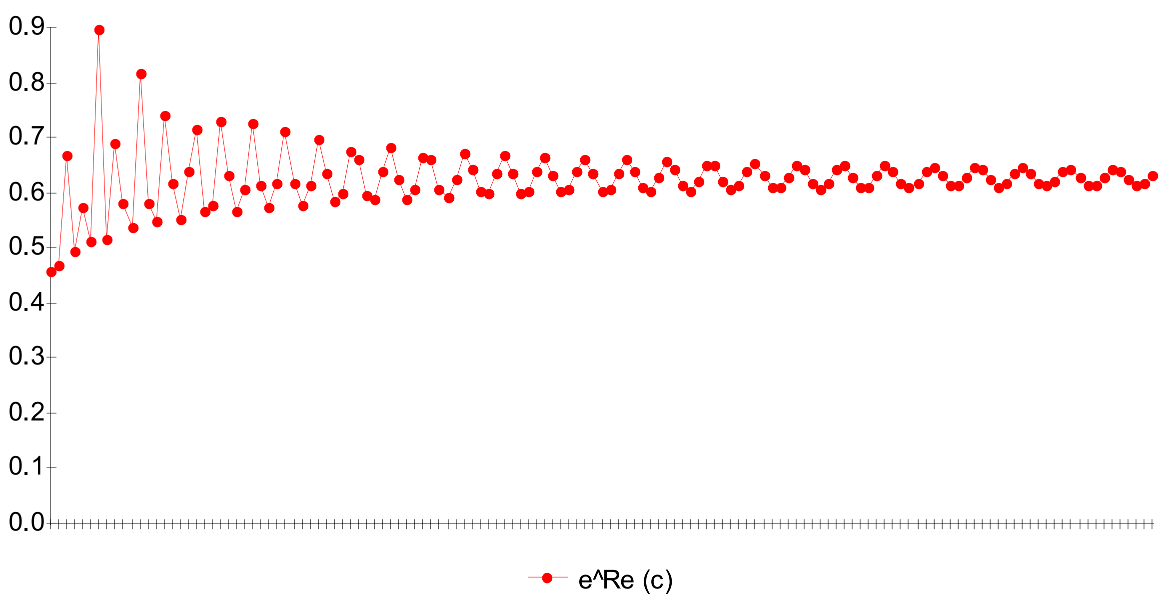

FIGURE 19 The exponent of the real part of c

Now, the question may arise, is (115) the same as n (x)? The answer is no. The correct equation is actually more similar to (113) and is the following:

$$n\ (x) = \frac{\upsilon}{1 + x \cdot (6\ e^{(T\ (x)\ /\ 1.5)})^{-1}} \tag{119}$$

It is this equation that converges on υ, and quite quickly. Where T (*x*) consists of real values. We then can plug *n* (*x*) from (119) into *y* (*x*) from (100) and then *y* (*x*) and a real T (*x*) (in place of *s*) into (101) to solve for the imaginary part of *s* in the Neutronic Zeta Function and confirm if (112) is true. In fact it is.

$$\lim_{x \to \infty} h\ (x) = -2.8689717\ldots \cdot \varepsilon \tag{120}$$

TABLE 31

x	Z (*Im* (*s*))
1	Undefined
2	Undefined
3	Undefined
4	Undefined
5	2.8727983…*i*
6	2.8689764…*i*
7	2.8689717…*i*
8	2.8689717…*i*
9	2.8689717…*i*

The Neutronic Zeta Function is always solved for an imaginary value, not complex or real. When plugging the real part of *s* into it, the value comes out to an imaginary. When plugging the imaginary part of *s* in following the above principles, it also comes out as an imaginary. For the result of the real or complex Zeta value, one simply adds the two together and divides by *i*.

It has already been proven earlier that the real part of *s* for all the non-trivial zeros of the Zeta Function is ½, but was acknowledged to be unacceptable considering modern mathematicians' preconceived notions. So in this section, to drive this proof home, one should use ½ as the real part for the first few values of *s*, which are already known in order to understand what happens. Remember, for the real part of *s*, using T*i* (*x*) as the imaginary part and ½ as the real, one should use (98) – (101).

TABLE 32

$Re\ (s)$	Z ($Re\ (s)$)
½	Undefined
½	Undefined
½	Undefined
½	Undefined
½	3.4143145…i
½	3.4142135…i
½	3.4142135…i
½	3.4142135…i
½	3.4142135…i

Where Z (½) converges almost instantly on $i\ (2 + 2^{½})$.

TABLE 33

Z ($Re\ (s)$) + Z ($Im\ (s)$)	Z (s)
Undefined	Undefined
Undefined	Undefined
Undefined	Undefined
Undefined	Undefined
3.4143145…i + 2.8727983…i	6.2171129…i
3.4142135…i + 2.8689764…i	6.2831853…i
3.4142135…i + 2.8689717…i	$2\pi i$
3.4142135…i + 2.8689717…i	$2\pi i$
3.4142135…i + 2.8689717…i	$2\pi i$

And since $2\pi i$ is the same thing as $0i$ or simply 0, and due to the extremely rapid convergence, the following can be stated:

$$Err\ (Z_{Ti}) = \sum_{x=5}^{\infty} Z\ (½ + Ti\ (x)) - 2\pi i = 0 \tag{121}$$

The actual difference of Z (½ + Ti (x)) minus 2πi (or the zeros of the Riemann Zeta Function), if considered a function of itself, which is indeed it is, is the inverse of yet another Neutronic Function but in this case with b (x) having no limit; this is because d in this case dz (x) is exactly equal to the exponent of log m (x) – log m (x-1), and therefore synced up with any change in x, which does itself converge. I will refer to this function simply as z (x).

$$\mathrm{z}\,(x) = \frac{1}{\mathrm{N}\,(mz)} \tag{122}$$

Where the N (m) is referred to here as N (mz) in order to show it is related to the Zeta Function. And this Neutronic Function is clearly definable in an ascending manner to infinity as the difference between the zeros of the Riemann Zeta Function and the zeros of the Neutronic Zeta Function, starting with x = 5, as 1-4 have not been defined and are not important for the hypothesis, as those zeros are already known to have a real part ½. The definition of this function is as follows:

$$\mathrm{N}\,(mz) = \frac{mz_5 - \rho z_5}{dz\,(5)}, \frac{mz_6 - \rho z_6}{dz\,(6)}, \frac{mz_7 - \rho z_7}{dz\,(7)} \ldots \tag{123}$$

Where, again, $\rho z_x = mz_x$ mod dz or dz (x) as a function (it was explained that d is a function beginning with $\rho_{max} = \pm\, i$; here one can see why this becomes important for the Definitive Neutronic Theorem). In such case, the following becomes irrefutably true.

$$\log\,(dz\,(x)) = \log\,(mz_x - m_{x\,-1}) \tag{124}$$

And the limit of (124) is as follows:

$$\lim_{x \to \infty} \log\,(dz\,(x)) = 6 \tag{125}$$

Performing the calculations, one find that the logs of the values mz_x are all equal to the following:

$$\log(mz_x) = 6(x - 4) + k(x) \tag{126}$$

Where $k(x)$ converges within just a handful of values of x, and has the following identity:

$$\lim_{x \to \infty} k(x) = \frac{2^{1/2}}{\pi} \tag{127}$$

Table 34 gives a sample of all these functions involved.

TABLE 34

x	N (mz)	log (N (mz))	dz (x)	log (dz)	k (x)
1	Undefined	Undef.	Undef.	Undef.	Undef.
2	Undef.	Undef.	Undef.	Undef.	Undef.
3	Undef.	Undef.	Undef.	Undef.	Undef.
4	Undef.	Undef.	Undef.	Undef.	Undef.
5	2.55E+02	5.54	8.39E+02	6.73	-.46
6	2.15E+05	12.27	4.63E+02	6.14	.27
7	9.90E+07	18.41	4.15E+02	6.03	.41
8	4.11E+10	24.44	4.07E+02	6.01	.44
9	1.68E+13	30.45	4.03E+02	6.00	.45
10	6.76E+15	36.46	4.03E+02	6.00	.45

While $\vartheta(x)$ is similar to $\Pi(x)$, $T(x)$ is similar to $t(x)$ and $Z(x) / i$ is similar to $\zeta(s)$, the following equation is not at all a similarity, approximation or average; it is exactly precise from $x = 5$ to infinity.

$$\sum_{x=5}^{\infty} Z(\tfrac{1}{2} + Ti(x)) - \frac{1}{N(mz)} = \sum_{x=5}^{\infty} \zeta(\tfrac{1}{2} + ti(x)) \tag{128}$$

In fact, all the values of (128) are exactly $2\pi i$, but since $2\pi i = 0$, there is nothing to add together at all from 5 - ∞. Thus, there can be nothing to add together on the right-hand side either (or at least the total number of positive values equals the total number of negative values).

Thus,

$$\sum_{x=5}^{\infty} \zeta\left(\tfrac{1}{2} + ti\,(x)\right) = 0 \tag{129}$$

And since the values where x from $ti\,(x) = 1, 2, 3, \&\ 4$, are already historically know to be the partners of a real part ½, equaling the first four non-trivial zeros, one then can now finally state in a fully acceptable manner that all the following non-trivial zeros of the Riemann Zeta Function to infinity also have a real part ½.

Conclusion

The mystery surrounding the Zeta Function has been centered solely on the *entirety* of the non-trivial zeros having a Real part ½. Not only myself, but also the large extent of other mathematicians working on this Hypothesis, have put a great deal of work and study into these zeros. It turns out, considering the above indeed concise, that discovering the connection between undefined figures and Jordan’s Theorem could provide the means to solve this mathematical puzzle in a most terse way. By utilizing the Neutronic Function in the ways demonstrated, coupled with all the points of the Theorems and the work set before me by the greatest of mathematical minds, all equations are discovered to be intimately connected and completed in a very confident way. While there are a growing number of RH proofs coming about, the sheer simplicity of this proof is considered by the author to be superior and worthy of acceptance. There are just 6 theorems required, complete with proofs for each, that lead to the proof of Riemann’s Hypothesis: the Prime Number Theorem, the Von Koch Theorem, Jordan’s Theorem, the Neutronic Theorem, the Definitive Theorem and lastly the Definitive Neutronic Theorem. The proof presented herein was simply a connection of these theorems together to one conclusion.

While still some today may want to continue testing the proofs of the above Theorems with sheer exhaustion of the calculations, which most certainly can be done, it should be maintained that computers might be better suited to bear the brunt of that tedious work, as such inductions are often weaker than logical proof anyway [20]. After such tests, as Hilbert explained, the next problem facing mathematicians, once the above proof is established in the minds of the modern mathematician, should consist in testing more exactly Riemann's infinite series for the number of primes below a given number [14]. But a creative individual should perhaps save their time struggling with the means to solve other great problems facing mathematics today with inquisitive minds focused on developing and progressing the problem solving methods themselves, as the above Theorems were intended to do. Greater solutions can and will be solved in a more confident and swift speed than problems of old. Such developments, in my most honest opinion, are the true advancements of mathematics on a whole.

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