The Calculus of God: Seven Mathematical Concepts of Genesis Chapter One

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Abstract

Creationist literature frequently describes mathematics as the "language of creation," to illustrate the idea of an intelligent Designer. Therefore, should we not expect the Genesis creation account to contain mathematical concepts? In this work, I discuss seven mathematical constructs apparent in the first chapter of Genesis. These include but are not limited to sets, ordinality, addition, multiplication, division, growth, and self-similarity. As these interrelated mathematical concepts are developed from the Genesis one text, two infinite series equations are produced; one convergent, the other divergent. The convergent infinite series is the mathematical definition of base-*e*. The divergent harmonic series produce time-interval ratios approximating *e*, and partial sums which allow for a numeric interpretation of creation's six nights and days. The set of integers obtained from the harmonic series equation correlates to the periodic table of the elements and the Fibonacci series, a well-known numerical construct observed in nature. With an organic development of the natural base-*e*, we examine Euler's formula for trigonometric functions, which embodies the four major branches of classical mathematics: arithmetic, analysis, algebra, and geometry. In the first chapter of Genesis, we find sufficient mathematics and numerical basis to support a literal seven 24-hour-day creation model of origins.

Keywords: Creation, model, design, mathematics, set theory, ordinality, division, periodicity, growth, self-similarity, spiral, exponential, logarithm, periodic table, element

Introduction

There is little argument between evolutionists and creationists when it comes to understanding that the natural world is subject to physical laws. It is equally understood that these physical laws are based upon mathematics. The disagreements arise when the source of these laws is considered. Mathematician Don DeYoung wrote that in his experience, secular science research addressing the origin of the laws of nature is sporadic and infrequent.[1] However, the popular media frequently cast doubt on the possibility of an orderly universe representing evidence of a creator God.[2] Creationists, however have the advantage of Scripture from which to draw inspiration in matters of origins. A creationist can read the results of secular research and formulate a completely

[1] DeYoung, "Origin," 264.
[2] Paulos, "Orderly Universe," 1.

different conclusion than that of the original researchers. Coupled with the natural beauty and order seen in our world, it is a natural step of logic for Christians to view mathematics as the "language of creation." But is this enough?

Mathematics: The Language of Creation, Fingerprint of God, Fabric of Creation

The characterization of mathematics as "the language of creation" or the "fingerprint of God" is popular in creationist literature. DeYoung has used the term to describe how "the laws of nature are closely connected with mathematics…"[3] When describing the existence of fundamental constants, such as e, phi, and pi, he writes that "one might suggest that these numbers were selected by God to shape the fabric of creation."[4] Bullinger, in the context of supernatural design states that "There can be neither works nor words without number."[5] More specifically, we read that God keeps track of the number of stars[6] and the number of hairs on our head[7]. Morris, when describing God's control of His creation, said "God is surely the Great Mathematician."[8] God created a world full of beauty and exquisite variety and detail. This is also true with mathematical patterns when they are graphed. Lisle has written about a special class of mathematical functions called "fractals". The Mandelbrot variety of these produce stunning images, some of which resemble seahorses and elephants. Lisle states that because these forms are so complex and beautiful, they "are an infinitesimal glimpse into the mind of God."[9].

Genesis 1: A Literal Interpretation

Early thinking on the temporal implications of a literal seven-day creation wavered between literal and literary interpretations over the centuries, especially during the advent of philosophy and science.[10] For example, first-century Jewish historian Josephus related creation account in a literal sense, while making the distinction that "Moses, when the seventh day was over, begins to talk philosophically;"[11] Turpin concluded that the "history of the teaching of the church on the days of creation lends extremely strong support to the 24-hour view being the correct interpretation of scripture."[12] However, Kulikovsky warns against "the common mistake of reading later ideas back into the biblical text."[13] It is the challenge of modern creationism to develop a coherent model of origins from literal interpretation of the Scriptures without introducing preconceived notions into the text. Popular theories of origins including "Day-Age Theory" and "Theistic Evolution" arise from misinterpretations of scripture and science. These theories are largely qualitative, not based in quantitative reasoning. For example, 2 Peter 3:8 reads "one day is with the Lord as a thousand years…" This verse is mistakenly applied to the observation of the sedimentary layers of the geological column representing eons of time.[14] Theistic evolution incorrectly equates the progression of dead fossils found in geological columns reflect the order of the Genesis creation

[3] DeYoung, "Origin," 263.
[4] DeYoung and Wolfrom, "Mathematics" (Loc. 416, Fundamental Numbers in Nature)
[5] Bullinger, "Numbers in Scripture," 1.
[6] Psalm 147:4, KJV
[7] Matthew 10:30, KJV
[8] Morris, "The Counting God," 1.
[9] Lisle, "Fractals," 7.
[10] Kulikovski, "Creation and Genesis," 206.
[11] Whiston, "Josephus," 49.
[12] Turpin, "Evangelical Commentaries, 81.
[13] Kulikovski, Creation and Genesis," 206.
[14] Niessen, "Theistic Evolution and the Day-Age Theory," 2.

account. Niessen states that "according to theistic evolutionists, plant and animal life flourished and dies at least 500 million years before man evolved."[15] He further shows that theistic evolution is easily refuted by Romans 5:12, which reads: "Therefore as through one man sin entered into the world, and death through sin.…"

Mathematical Creation Models

A current trend in modern creationism is to develop Scripture-based mathematical models of creation. Coupling the absolute truth of scripture with the power of mathematical reasoning could help us to find correlations between creation and science. For example, Humphreys "White Hole Cosmology Model" begins with the original substance being liquid water[16] compressed until it "rips apart" into its constituent elements and beginning a thermonuclear fusion process "forming heavier nuclei."[17] The physicist further applies Einstein's equations of general relativity to the biblical descriptions of the heavens being "stretched out" found in Isaiah 40:22 and Jeremiah 10:12. His model offers a plausible explanation for light from distant galaxies, red-shifts, and the cosmic background radiation.[18] As he continues to defend his cosmology,[19] his research helped open the door for the R.A.T.E. project, during which a collection of scientists belonging to the Creation Research Society investigated the topic of radioactive isotopes and the age of the earth.[20] Similar to Humphreys, Powell applies gravitational field equations, Schwarzschild radius and Einstein's equation of special relativity to develop the heat represented by the "unification of fundamental forces" in line with the Deuteronomy 4:11 description of God as "a consuming fire."[21]

Mathematical Reasoning in Scripture?

Mathematical reasoning in Scripture exists in many forms. When it comes to the mere consistency of linguistic signs, statements in Scripture can resemble mathematics, according to Oller.[22] This is through the use of signs in the Genesis 1 narrative. An example is Genesis 1:3,4. God spoke the light into existence, he saw the light, and obtained information from the light, that it was good. God speaking the light into existence is a "motoric sign." God seeing the light is a "sensory" sign. Seeing the light looking good is a "linguistic" sign. These three types of signs together form the material world of ordinary existence, and they must remain consistent, just as they do in mathematics. Oller states that "the miracle of communication is so common that we almost always take it for granted."[23] In Genesis 1, God is communicating to us the nature of our origin and giving us an insight into the process. This orderly process is explained in mathematical terms, either directly or indirectly by association of what was created. In the first chapter of Genesis alone, we see elements of set theory, ordinality, division, addition, multiplication, growth, and self-similarity. In this work, we examine each of these concepts.

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[15] Ibid, 7.
[16] Humphreys, "Starlight and Time," 32.
[17] Ibid, 33.
[18] Ibid, 84.
[19] Humphreys, "New Vistas"
[20] Vardiman, "Radioisotopes"
[21] Powell, Unification of Fundamental Forces," 19.
[22] Oller, "The Mere Consistency of Signs," 1
[23] Ibid, 1

Set Theory: *"In the beginning…the earth was without form, and void;" Genesis 1:1,2*

Like many children who were in elementary school in the early 1970's, I was taught set theory as a consequence of the "New Math" curriculum popular during the same era. Little did I know at the time, I was learning abstract algebra; a subject usually offered to collegiate math majors. Sets were easy for me to understand and I considered them almost trivial as a youngster. Set theory was the work of Georg Cantor and is believed to have first emerged in 1873 while considering the limitations of the *linear continuum*, more commonly referred to as the number line.[24] Cantor had a Christian upbringing, as his father was a devout Lutheran, and his mother, a Roman Catholic.[25] Much of his work in set theory was informed and inspired by his knowledge of a God who wields mastery of the infinite. Indeed, we see set theory in the first two verses of Genesis as God is laying a mathematical foundation of His creation.

Origin

An important tool used in set theory is the number line. There are many types of number lines, but the one that Cantor frequently studied was the "real" line, which would represent all of the real numbers, *R*. Although the entirety of the real numbers is hard to define rigorously, a real number is any number that can be placed upon an infinitely long number line.[26] "Zero" is a real number, and its position on the real line is called the "origin." This concept is clearly established in the first three words of Genesis 1:1 "In the beginning…" Having established an origin, God has defined a continuum on which to place the heaven and the earth. Since Genesis 1:1 asserts the beginning and has not yet advanced into day one of Genesis 1:2-5, we can also refer to this first signpost of creation as "Day Zero." The distinction may seem trivial, but as we will see later, Day Zero is an unexpected, but arithmetical necessity.

Elements, Objects

In set theory, a set is defined as a "well-defined collection of objects. The objects of in the set are called *elements* or *members* of the set."[27] In Genesis 1:1, God has defined a set of objects {beginning, heaven, earth}. Sets can also be globally defined, as in the case of "the set of all real numbers, R" I alluded to earlier. A crucially important point Hughes makes is that "the narrator (God) uses concepts of mathematics embedded within the [creation] account without expounding the conceptual depth which underlies these concepts."[28] He continues:

> Sets are based upon the abstract concept that assumes the existence of universals and not merely particulars by which each entity is viewed as independent of all the others. A universal is the grouping of instances by their consistent characteristics or qualities…. The challenge is how to account for their existence: Are they real?[29]

Empty Set

Genesis 1:2 is a difficult passage to grasp without set theory. How may one have an earth, but it be without form and void? For example, matter is commonly defined as "that which occupies

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[24] Bagaria, "Set Theory," 1.
[25] DeYoung, "Pioneer Explorers," 37.
[26] Houston, "How to Think Like a Mathematician," 5.
[27] Ibid, 3.
[28] Hughes, "Mathematics—from the Mind of God," 2.
[29] Ibid, 2.

space and has mass; physical substance." Not meant to be a rigorous definition, matter in our everyday experience possesses these qualities. Therefore, it is hard to visualize a void, formless, dark earth. I explain this concept using an empty cake pan. If I am making a cake, I may point at the empty pan and refer to it as "the cake." Similarly, God is increasing the number of elements of creation. Let C_0 be defined as the set of creation thus far, i.e., C_0 = {0, heaven, earth, void, darkness, face, deep, waters}. Notice that I included "void" as one of the elements. Set theory allows me to do this using the concept of "empty set." Empty set is defined as "as set with no elements" and is denoted by "{}" or "ϕ". Therefore, C_1 = {0, heaven, earth, ϕ, darkness, face, deep, waters}. It is important to note that zero is a real number and therefore is not the same as empty set. Also, empty set has a certain ubiquity in the way that it is a subset of any set *X, therefore it is implicit with the definition of* C_x. Therefore, I can write C_2 = {0, heaven, earth, darkness, face, deep, waters} with empty set just being a subset of C_2. But C_1 is not equal to C_2. We will examine this more in the next section, *Cardinality*. It is not trivial that God asserted this interesting void to be a dubious member of the elements of His creation. This adds further weight to the idea that God is laying down a complex mathematical foundation by including abstract concepts such as void, or empty set.

Cardinality

Cardinal numbers are those which denote finite quantities. God explicitly uses the cardinal number *two* in Genesis 1:16" "And God made *two* lights; the greater light to rule the day, and the lesser light to rule the night…" The cardinality of a finite set *X* can be determined by simply counting the number of members in the set. Our set C_1 = {0, heaven, earth, ϕ, darkness, face, deep, waters} has a cardinality of eight. However, C_2 = {0, heaven, earth, darkness, face, deep, waters} has a cardinality of seven. The reason why C_1 is not equal to C_2, is because {ϕ} is not equal to ϕ. Empty sets {} and ϕ are equal, each with cardinality of zero; while {ϕ}, is not an empty set, it has a cardinality of one. Hughes illustrates the significance of combining the use of cardinal and ordinal numbers in the creation account:

> Some writers have observed the use of the ordinal adjective ('second', 'third', etc.) with the word 'day' indicates that God is speaking of standard 24-hour days, and that the use of the cardinal ('one') and ordinals to number the days of creation demands a sequential chronological reading of the text.[30]

Hughes' mathematical interpretation of the days of creation concur with Hasel's theological approach, concluding that God "could not have produced more comprehensive and all-inclusive ways to express the idea of a literal "day" than the ones that were chosen."[31] In Stambaugh's semantical analysis, he states that the author of Genesis employed "redundancy for redundancy's sake,"[32] to emphasize that the days of creation were solar days. He included the idea that "numbers" were used along with 'morning and evening' to convey the idea of a literal day.

[30] Ibid, 2.
[31] Hasel, "The Days of Creation," 18.
[32] Stambaugh, "The Days of Creation," 76.

Ordinality:" *…And the evening and the morning were the first day." Genesis 1:5*

An ordinal is a number that indicates position in a series. Terms such as first, second, third, and fourth are examples of ordinal numbers. Of their use in the Genesis creation account, Hughes states:

> Some writers have observed that the use of the ordinal adjective ('second', 'third', etc.) with the word 'day' indicates that God is speaking of standard 24-hour days, and that the use of the cardinal ('one') and ordinals to number the days of creation demand a sequential chronological reading of the text. However, while this is true, they often fail to observe that the use of the ordinals indicates that the enumeration of the creation days is of fundamental importance.[33]

While referring to the Genesis creation account Morris states that "each stage was an appropriate preparation for the succeeding stage and for all of them the ultimate purpose of providing a suitable home for man."[34] Sarfati points out an "interesting [ordinal, cardinal] pattern in the Hebrew, which is not often reflected in English translations."[35] He states that "a literal translation of Creation Week would be Day One, a second day, a third day, a fourth day, a fifth day, the sixth day, the seventh day."[36] On the use of a cardinal for Day 1 of creation, he states:

> The answer may lie in the use of the terms "night", "day", "evening", "morning". Genesis 1:5 begins the cycle of the day. …. Having an evening and a morning amount to having one full day. Hence the following equation is what Genesis 1:5 expresses: Evening + morning = one day."[37]

Here, Sarfati has used a mathematical equation to relate the meaning of Genesis 1:5, invoking the concept of addition, further strengthening the argument that Genesis 1 is meant to be read as an additive cycle of creative activity.

Addition and Multiplication:" *…And the evening and the morning were the second day." Genesis 1:8*

As Sarfati illustrates, the use of "and" in both the Hebrew and English translation implies simple addition, not dissimilar to what we are taught in primary school when solving word and story problems. Among the 31 verses of Genesis one, there are 94 instances of the word 'and' in the KJV.[38] Clearly, God is adding to His creation in a cyclic manner, this addition being the simple mathematical operation with most are familiar.

Boolean Logic and Probability: AND

However, this prolific use of 'and' also has profound significance when viewed from a perspective of the Boolean logical 'AND' function. With most every element that God is adding to the set creation via the 'AND' function he is decreasing the probability that it can be duplicated randomly.

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[33] Hughes, "Mathematics—from the Mind of God," 2.
[34] Morris, "Scientific Creationism," 209.
[35] Sarfati, The Numbering Pattern of Genesis," 1.
[36] Ibid, 1.
[37] Ibid, 3.
[38] Strong, "Strong's Exhaustive Concordance of the Bible, Appendix" 4.

For example, to calculate probability of *A* AND *B* (we assume *A* and *B* are independent for simplicity) we have:

(1) $P(AB) = P(A)P(B)$

Simply stated: the probability of *A* and *B* occurring equals the probability of *A* multiplied by the probability of *B*.[39] In this second interpretation of AND, multiplication is implicit.

Multiplication, Factorial and Permutations

Also with successive addition, multiplication is defined. With multiplication, the factorial function comes into existence. The factorial of *n*, or *n*! is defined as the product of all positive integers less than or equal to *n*, a non-negative integer.[40] Some factorials:

(2) 0! = 1 (by convention of empty product)
(3) 1! = 1
(4) 2! = (2 x 1) = 2
(5) 3! = (3 x 2 x 1) = 6
(6) 4! = (4 x 3 x 2 x 1) = 24

Factorial is used in statistics to calculate permutations, or how many different ways one can arrange a group of objects. For example, for "3!" there are six ways to arrange three objects *a, b, c*:

$\{a,b,c\}, \{b,c,a\}, \{c,a,b\}, \{c,b,a\}, \{a,c,b\}, \{b,a,c\}$

Using a simple "order-of-magnitude" estimation, for each item God added to creation we can apply factorial to express the complexity of creation as stated in Genesis 1. With the 94 given sub-steps to creation, this would estimate to over 94! possible permutations of the creative objects. This implies that there would be greater than 1:94! probability of simply repeating the same creative order as stated in Genesis 1. This estimates to greater than a one in 10^{146} chance, because with each element God adds to the 'set of all creation' over time, the choices available that God could add to the next step increases. It is necessary to note here that I am considering the literal number of instances of "and" in Genesis 1 to add emphasis, and I am not implying that God only did 94 things during the six-day process. For now, I am developing the mathematics of the process as stated in the Biblical text for further analysis. To illustrate this mathematical process, refer to Figure 1 where we consider these first few examples of what God may have "AND-ed" in the first four verses of Genesis 1.

[39] Lyons, "Statistics for Nuclear and Particle Physicists," 33.
[40] Swokowski, "Precalculus," 447.

Figure 1. Sub-Step Process and Permutations of Creation: Genesis 1:1 – 1:4

Verse and Sub-Step	Creative Work Item Sets Available for Each Sub-Step	Factorial Represented	Permutations Possible
Genesis 1:1a	{Heavens}	1!	1
Genesis 1:1b	{Heavens, Earth}	2!	2
Genesis 1:2a	{Heavens, Earth, Form}	3!	6
Genesis 1:2b	{Heavens, Earth, Form, Darkness}	4!	24
Genesis 1:2c	{Heavens, Earth, Form, Darkness, Waters}	5!	120
Genesis 1:3a	{Heavens, Earth, Form, Darkness, Waters, Sound}	6!	720
Genesis 1:3b	{Heavens, Earth, Form, Darkness, Waters, Sound, Light}	7!	5,040
Genesis 1:4a	{Heavens, Earth, Form, Darkness, Waters, Sound, Light, Sight}	8!	40,320
Genesis 1:4b	{Heavens, Earth, Form, Darkness, Waters, Sound, Light, Sight, Divide}	9!	362,880

Therefore, we could say that for every *nth* instance of 'and' in Genesis 1, God had *n*! creative combinations with which to form the next new creative object, *n*. From these, God is not only relating the order of creation but describing something incredibly unique by using mathematical terminology and processes.

Infinite Series

With set theory, cardinality, ordinality, and successive addition, we now have the mathematical basis to begin discussing infinite series. An infinite series is an expression of the form:

(7) $\sum_{n=1}^{\infty} a_n = a_1 + a_2 + a_3 + \cdots + a_n + \cdots$

Where $\{a_n\}$ is an infinite sequence of real numbers.[41] For our discussion, we will be working with finite partial sums, S_n. The *nth* partial sum S_n of Eq. (1) is defined as:

(8) $S_n = a_1 + a_2 + a_3 + \cdots + a_n$

We represent this idea of 94 instances of 'and' in Genesis chapter one mathematically using partial sums, and $a_n = n!$ from $n = 1$ to 94, I write:

(9) $S_{94} = 0! + 1! + 2! + \cdots + 94! \geq 10^{146}$ possible permutations of the Genesis 1 creative process.

Therefore, (9) represents the complexity spoken by merely making 94 given choices using the mathematical concepts of sets, ordinality, addition, and multiplication.

[41] Edwards and Penny, "Calculus," 584

Division: *"…and let it divide the waters from the waters." Genesis 1:6*

Among the mathematical concepts we have found in Genesis 1, we include division. The principle of division is seen throughout the Word of God and is a very important spiritual concept and well as the mathematical rendering we will discuss here. The first instance of the term "divide" in the Bible is found in Genesis 1:4, "And God saw the light, that it was good: and God divided the light from the darkness." This was the fundamental division, and it mathematically divided our cyclic 24-hour day into 12-hour halves. The next division we read about occurs in Genesis 1:8, "And God said, Let there be a firmament in the midst of the waters, and let it divide the waters from the waters."

The Firmament

The firmament appears early in the Genesis creation account and it performs a fundamental purpose of division. In Genesis 1:8, it divides waters, and later in Genesis 1:14, the lights placed in firmament fulfil the purpose of dividing the day from the night. Defining the firmament, McGuire states:

> In modern translations, *râqî'* is most often translated "expanse" which has the meaning of that which was spread out or stretched. It comes from the Hebrew word *rq'* which means to hammer out [HALOT] and by analogy to spread like a thin plate metal that is hammered."[42]

It is this definition of the firmament that inspires Humphrey's White Hole Cosmology,[43,44] where its interpretation becomes highly mathematical. I also build upon Mortensen's interpretation of the firmament, as he states "often it refers to spreading, beating, or hammering a thin layer of metal (gold or silver or bronze) onto an object."[45] In this application, a finite amount of material is periodically beaten into a thinner, longer piece. Each strike can be interpreted as an ordinal number, i.e., first strike, second strike, third strike, etc. With each strike, the material's thickness becomes a fraction of what it was earlier, however the sum of the material remains constant. Mathematically, this is a picture of a convergent infinite series for a finite amount of perfect material being beaten into a long, thin shape. It is via convergent infinite series by which we obtain an important and ubiquitous fundamental constant, "*e*".

The Exponential "*e*"

The base of natural or "Napierian" logarithms, is most commonly referred to as "*e,*" or Euler's Number. This fundamental constant is an irrational number and carries the approximate value $e \approx 2.7183$. DeYoung considers this number one of a handful of "intriguing physical constants [that] are embedded in nature..."[46] He further states that "the number has applications in exponential growth and decay. It also appears in the solution of many probability and calculus problems."[47] As to the first appearance of what was to become the Napierian logarithmic base "*e*", Maor writes:

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[42] McGuire, "The Waters Above," 155.
[43] Humphreys, "Starlight and Time," 66.
[44] Ibid, "New Vistas," 195.
[45] Mortenson, "The Firmament," 114.
[46] DeYoung and Wolfrom, "Mathematics," Loc. 416
[47] Ibid.

> We do not know who first noticed the peculiar behavior of the expression $(1+1/n)^n$ as n tends to infinity, so the exact date of birth of the number that would later be denoted by e remains obscure. It seems likely, however, that its origins go back to the early seventeenth century, around the time when Napier invented his logarithms.[48]

Boyer mentions that Jacques Bernoulli proposed the problem of continually compounding interest using the same equation $(1+1/n)^n$ in his *Acta eruditorum* in 1686.[49]

(10) $e = (1+1/n)^n \quad \text{as } n \rightarrow \infty$

From (10), the exponential "*e*" can be expressed as the sum of an infinite series of constants $1/n!$ where $n = 0, 1, 2, 3\ldots$:[50] Maor states that "this infinite series was discovered by Newton in 1665; it can be obtained by the binomial expansion of $(1+1/n)^n$ by letting $n \rightarrow \infty$ …" [51]

(11) $$e = 1 + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \cdots + \frac{1}{n!} \quad \text{as } n \rightarrow \infty$$

Comparing the Infinite Series Derivation of "*e*" to God's 94-Step Creative Process Formula
I see a correspondence between Equations (9) and (11). Where (9) is a partial sum of the individual factorial terms for each of the 94 ordinal sub-steps:

(12) $$S_{94} = 0! + 1! + 2! + 3! + \cdots + 94! \cong 10^{146}$$

Using Equation (11), we can develop an approximation of "*e*" to 146 decimal places expressed as the partial sum of the reciprocals of (12), as in

(13) $$e_{94} \approx \frac{1}{0!} + \frac{1}{1!} + \frac{1}{2!} + \frac{1}{3!} + \cdots + \frac{1}{94!} \quad \text{as } n \rightarrow 94 \text{ Sub-steps of Genesis 1}$$

To understand the correspondence, we revisit the definition of the firmament being a defined piece of perfect material being beaten into shape. Perfect material would be able to be worked into a shape which approaches infinite length and infinitesimal thinness. For this perfect material to exist, it's size could represent a limit of a convergent infinite series. In this case, I assign a size "*e*" to the workpiece. The process of creating and working the firmament over 94 remaining steps can be expressed as shown below (I show the first five of the 94 *n*-steps for brevity):

[48] Maor, "E: The Story of a Number, 26.
[49] Boyer, "A History of Mathematics," 419.
[50] Havil, "The Irrationals" 109.
[51] Maor, "E: The Story of a Number," 151.

Figure 2. Illustrating working ideal material of size "e" over five of 94 sub-steps

Sub-step	Original Size	Workable Amount	"Hit" Value Term, "Beating the râqî into Shape"	Amount Left to Work
1	2.718281828…	2.718281828…	$\frac{1}{0!} = 1$	1.718281828…
2	2.718281828…	1.718281828…	$\frac{1}{1!} = 1$	0.718281828…
3	2.718281828…	0.718281828…	$\frac{1}{2!} = 0.5$	0.218281828…
4	2.718281828…	0.218281828…	$\frac{1}{3!} = 0.1666666…$	0.051615162…
5	2.718281828…	0.051615162…	$\frac{1}{4!} = 0.0416666…$	0.009948495…

We saw that the terms of (13) are the reciprocals of those of (12). To put this into context, for each sub-step of creation, God had to choose the configuration of the new object *n* as the choices for each *n*-step increase factorially, as seen in equations (1) through (6) and Figure 1. Therefore, God had to make the 1/*n*! choice to speak creation into its proper form for that *n*-step. With this idea in mind, we can say that the creative process put forth in Genesis 1 could be represented mathematically as the same convergent infinite series that defines the Napierian logarithmic base "*e*". Here, we obtained an approximation of *e* from the 94 sub-steps of creation in Genesis 1. Next, we will show another infinite series from which *e* is approximated over the twelve half-days of creation described in Genesis 1.

The Harmonic Series

Another application of the mathematical concepts of set theory, cardinality, ordinality, addition, and division is the harmonic series. This is defined as the sum of an infinite series of constants 1/*n*, where *n* = 1, 2, 3… and may be expressed as:

$$(14) \qquad S_n = 1 + \frac{1}{2} + \frac{1}{3} + \frac{1}{4} + \cdots + \frac{1}{n} \text{ as } n \rightarrow \infty$$

Although the structure of the harmonic series equation is similar to that of equation (11), this series is divergent, as its partial sum S_n becomes arbitrarily large as *n* approaches infinity. The harmonic series is seen throughout nature and has many applications in physics. For example, a vibrating guitar string exhibits a fundamental frequency based upon its tension, mass and linear mass density.[52] Along with its fundamental frequency, the string will develop standing-wave patterns called "normal modes" that are integer multiples of the fundamental frequency. These modes form a harmonic series, and the modal frequencies resulting are called harmonics. One specific area of physical science where this phenomenon is observed is blackbody radiation. In the early 20th century, Max Planck proposed a blackbody equation[53] which agreed with experimentation at all wavelengths. This led to some bold assumptions which became the basis of quantum physics. Although this paper is not on blackbody radiation or quantum physics, Planck's assertions that molecules can only have discrete values of energy based upon an integral value he called the

[52] Serway, "Physics," 555.
[53] Serway, "Physics" 1293.

quantum number, n. This gives discrete energy levels E allowed for molecules bases upon their natural harmonic frequency f, given by:

(15) $E_n = nhf$ where h is Planck's Constant 6.626 x 10^{-34} J s

This mathematical principle is central in physical chemistry as the principal quantum numbers develop the periods of the periodic table of elements, as well as determining the size of electron shells K, L, M, N of molecular sub-orbitals *s, p, d, f.* In this context, it is very appropriate that the first thing God created was light, as we understand the photon as a quantized "packet" of energy. Since atoms are the building blocks of creation, it follows that the harmonic series should be an important mathematical concept to creation research. Of the harmonic series, DeYoung states that it is an example of "the fascinating language of creation."[54] Perman recognized the beauty and order of the periodic table of elements, electron shells and orbitals. "Looking into the nature of atoms, creation is clearly seen. When God created, He brought order to the universe even in the smallest things…"[55] Thomas[56] references Dürr stating that "more than 99 percent of the mass of ordinary matter comes from protons and neutrons, and in turn about 85 percent of their mass comes from this confined energy."[57] Thomas tied this binding of energy to Morris's interpretation of Genesis 1:2 in his commentary:

> And the Spirit...moved. However, this condition prevailed only momentarily. Then, the "Spirit" (Hebrew ruach) of "God" (Elohim) proceeded to "move upon the face of the waters" (literally, "vibrate in the presence of the waters"). Waves of gravitational energy and waves of electro-magnetic energy began to pulse forth from the great "Breath" (another meaning of ruach) of God, the Prime Mover of the universe. The unformed "earth" material (Hebrew eretz), as well as the "waters" permeating it (Hebrew shamayim) quickly coalesced into spherical form under the new force of gravity, and the first material body (Planet Earth) had been formed at a point in space.[58]

Morris' general idea can be supported mathematically with a combination of two infinite series (13) and (14). As stated earlier, equation (13) can be represented by a stretched piece of ideal material of length e. If this ideal material from (13) is perturbed by a periodic working harmonic vibration (14), we obtain a mechanism to describe the discrete energies and order God imparted to atoms and the elements. Since both (13) and (14) grow as n approaches infinity, the divergent harmonic series can modulate the convergent infinite series defining e. As n approaches infinity, the harmonic frequencies can increase unbounded as the precision of the length $L \rightarrow e$ improves.

[54] DeYoung and Wolfrom, "Mathematics," Loc. 1376.
[55] Perman, "Atoms and God's Order," 1.
[56] Thomas, "Particle Physics is Consistent with Genesis," 1.
[57] Dürr, "Ab Initio Determination of Light Hadron Masses"
[58] Morris, "The New Defender's Study Bible," Genesis 1:2

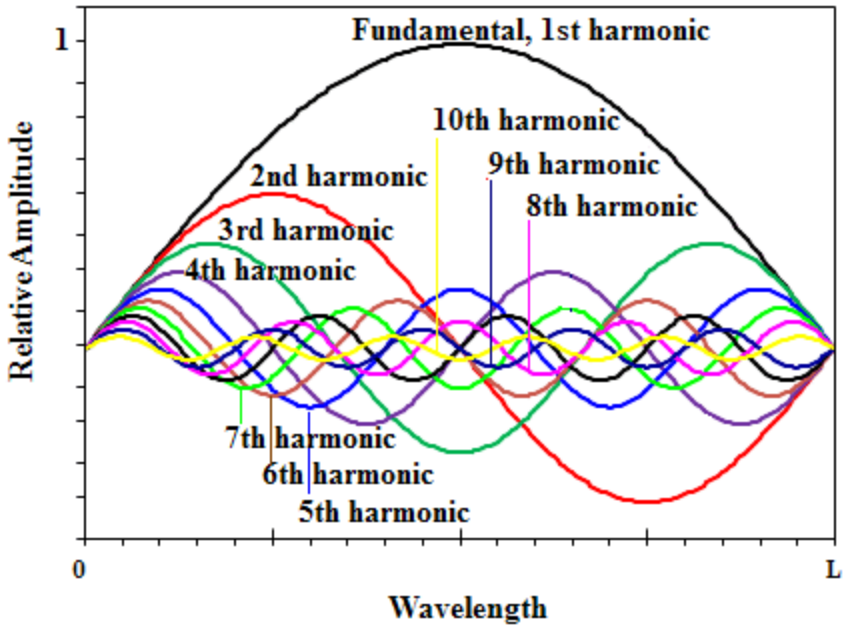

Figure 3. Illustration of a string of ideal material perturbed by the *n*th harmonic series with L → *e*, the natural logarithmic base. The size L → *e* of the ideal material grows more *precise* as *n* and the *n*th harmonic modes approach infinity. (Illustration from Suwanarat et al.).

Twelve Half-Days of Creation and the Harmonic Series

The application of partial sums of the harmonic series lends itself well to the Genesis 1 creation account. With the harmonic series, partial sums increase very slowly with n. For example, consider an integer N_A, such that:

$$(16) \qquad \sum_{n=1}^{N_A} \frac{1}{n} \geq A$$

For $A = \{5,10,20,100,1000\}$, it is known that $N_5 = 83$, $N_{10} = 12{,}367$, $N_{20} = 272{,}400{,}600$, $N_{100} = 1.5 \times 10^{43}$, and $N_{1000} = 1.1 \times 10^{434}$, with the last example well beyond the total number of elementary particles in the known universe.[59] In Figure 4, I have tabulated similar n-values for partial sums S_n over ten steps, zero to nine. [60] Steps 0 through 7 can be directly applied to the seven days of creation, with Step 1 representing Day 1, and Step 2 representing Day 2 and so on through Step 7, Day 7. As the chart illustrates, the n_{step} values for each day develop time-interval ratios approximating the natural logarithmic base e with the preceding step. The precision of the time-interval ratio approximation of e is within 0.03% at Step 7, with the ratio approaching e as n approaches infinity. In basic terms, with each day of Genesis creation, the indexing value n_{step} increases by a factor approximating e. Earlier, I stated that Genesis 1:1 could represent a Day 0, before God began counting days. This fits an approximate $e^{(Day)}$ relationship Figure 4 is illustrating, beginning with Step 0 where the harmonic series equation would give $e^0 = 1$.

[59] Edwards and Penney, "Calculus," 591.
[60] Marshall, "The Chemistry of God," 93.

Step	Harmonic Series Equation	n	S_n	Time Interval Ratio n_{step}/n_{step-1}	=	Compare to e
0	$\sum_{n=1}^{n=1}\frac{1}{n}=\{\frac{1}{1}\}$	1	1	-	-	-
1	$\sum_{n=1}^{n=4}\frac{1}{n}=\{\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}\}$	4	2.08	4/1	4	2.718
2	$\sum_{n=1}^{n=11}\frac{1}{n}=\{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{11}\}$	11	3.02	11/4	2.750	2.718
3	$\sum_{n=1}^{n=31}\frac{1}{n}=\{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{31}\}$	31	4.03	31/11	2.818	2.718
4	$\sum_{n=1}^{n=83}\frac{1}{n}=\{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{83}\}$	83	5.00	83/31	2.677	2.718
5	$\sum_{n=1}^{n=227}\frac{1}{n}=\{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{227}\}$	227	6.00	227/83	2.735	2.718
6	$\sum_{n=1}^{n=616}\frac{1}{n}=\{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{616}\}$	616	7.00	616/227	2.714	2.718
7	$\sum_{n=1}^{n=1674}\frac{1}{n}=\{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{1674}\}$	1674	8.00	1674/616	2.718	2.718
8	$\sum_{n=1}^{n=4550}\frac{1}{n}=\{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{4550}\}$	4550	9.00	4550/1674	2.718	2.718
9	$\sum_{n=1}^{n=12368}\frac{1}{n}=\{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{12368}\}$	12368	10.00	12368/4550	2.718	2.718

Figure 4. Table of Harmonic Series Partial Sums $S_n \cong$ 1 to 10. The ratio of subsequent partial sums *n*-values approach *e* as *n* approaches infinity.

The most interesting aspect of Figure 4 and the harmonic series equation (14) it represents, is that the natural logarithmic base *e* is being developed organically and simultaneously using the same n_{step} index factor as the definition of *e* in equation (11). This shows how the natural logarithmic base *e* may have been developed during the creation account via the two concurrent infinite series equations for which a textual basis exists in Genesis 1. Figure 4 also illustrates my previous point that God probably made more than 94 choices during the six days of creation. The table gives an *n*-value of 616 for the end of the sixth day, implying 616 creation decisions could have been made through day six giving 616! permutations. Figure 5 also features the harmonic series equation, but

instead tabulates the partial sums S_n representing 12 half-days of creation commensurate with the Genesis text "the morning and the evening" language.[61]

Step	n_{step}	Harmonic Series Equation	S_n Step Finish	$n_{step} - n_{step-1}$ Step Range	Fibonacci Compare
Day Zero	1	$\sum_{n=1}^{n=1} \frac{1}{n} = \{\frac{1}{1}\} = Sn$	1	1	1
Night 1.0	2	$\sum_{n=1}^{n=2} \frac{1}{n} = \{\frac{1}{1}+\frac{1}{2}\} = Sn$	1.5	1	1
Day 1.5	4	$\sum_{n=1}^{n=4} \frac{1}{n} = \{\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+\frac{1}{4}\} = Sn$	2.08	2	2
Night 2.0	7	$\sum_{n=1}^{n=7} \frac{1}{n} = \{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{7}\} = Sn$	2.59	3	3
Day 2.5	11	$\sum_{n=1}^{n=11} \frac{1}{n} = \{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{11}\} = Sn$	3.02	4	5
Night 3.0	19	$\sum_{n=1}^{n=19} \frac{1}{n} = \{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{19}\} = Sn$	3.55	8	8
Day 3.5	31	$\sum_{n=1}^{n=31} \frac{1}{n} = \{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{31}\} = Sn$	4.03	12	13
Night 4.0	51	$\sum_{n=1}^{n=51} \frac{1}{n} = \{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{51}\} = Sn$	4.52	20	21
Day 4.5	83	$\sum_{n=1}^{n=83} \frac{1}{n} = \{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{83}\} = Sn$	5.00	32	34
Night 5.0	137	$\sum_{n=1}^{n=137} \frac{1}{n} = \{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{137}\} = Sn$	5.50	54	55
Day 5.5	227	$\sum_{n=1}^{n=227} \frac{1}{n} = \{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{227}\} = Sn$	6.00	90	89
Night 6.0	373	$\sum_{n=1}^{n=373} \frac{1}{n} = \{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{373}\} = Sn$	6.50	146	144
Day 6.5	616	$\sum_{n=1}^{n=616} \frac{1}{n} = \{\frac{1}{1}+\frac{1}{2}+\cdots+\frac{1}{616}\} = Sn$	7.00	243	233

Figure 5. Partial sums representing twelve half-days of creation. The first six n_{step} values correlate to the periodic table of the elements. Also, the range between subsequent n_{step} values correlate strongly to the Fibonacci series.

The partial sums developed from Day 0 through Day 6.5 generate n_{step} values that that are very interesting in the fields of chemistry, physics, and theology.[62] In this work, I focus on the set of n_{step} values obtained from Day 0 through Day 3.5, {1,2,4,7,11,19,31}. This exponential growth progression correlates to the periodic table of the elements, as we will examine in the next section. Another interesting feature of Figure 5 involves taking the ranges between half-day steps.

(17) {1,1,2,3,4,8,12,20,32,54,90,146,243} Harmonic Sequence

(18) {1,1,2,3,5,8,13,21,34,55,89,144,233} Fibonacci Sequence

These difference values give us a set of integers which closely correlate to the Fibonacci sequence, a well-known growth pattern seen in many branches of science including botany and physics.

[61] Marshall, "The Chemistry of God," 95.

[62] Ibid.

Growth Functions: *"…be fruitful and multiply…": Genesis 1:22*

We see the mathematical term "multiply" twice during Day 5 of creation, as God has created moving creatures, whales and winged fowl. The waters of the earth are to bring these creatures forth "abundantly." Later, in Day 6, God is creating the land animals and man, instructing them also to be "fruitful and multiply", but without the modifier "abundantly." Although this distinction is linguistic and qualitative, we can infer that there are degrees of growth that God has employed. As such, we will examine the non-linear function that have been developed thus far which apply to the population growth on Days 5 and 6, in addition to those implicit in creation during Day 3 based upon what was created.

Exponential Functions, base *e*

Since the natural logarithmic base *e* has been defined early in the creation process via infinite series, it is available for God to increase aspects of His creation above and beyond simple linear multiplication. The base *e* exponential growth formula[63], where P_0 is initial quantity and *k* is a constant that allows for different scales of time, *t*.

$$P(t) = P_0 e^{kt} \tag{19}$$

Applying the exponential growth model to Day Five and Six population growth, it has been shown that a population beginning with one human male and female only needs to double 32 times, once every 150 years to achieve a population of 8.6 billion people.[64] Thirty-two doublings, each taking 150 years, equates to 4800 years total estimated time since creation. In this case, using (17):

$$P(150) = e^{k(150)} = 2 \tag{20}$$

Calculate yearly doubling time constant *k* = .004621

$$P(4800) = 2e^{(0.004621 \cdot 4800)} = 8.59\ Billion\ People \tag{21}$$

In a population study of ancient Australia focusing on a similar period 5000 years ago, researchers compared the exponential growth model to their radiocarbon dating of rock shelters. They were able to fit their exponential "5 KA Acceleration Model" with a 97.3% correlation suggesting a noteworthy population explosion in Australia over the last 5000 years.[65]

The "Genesis 1" Periodic Table Elements: Days 1 - 3

A simple numerical analysis of the chemical elements created during the first three days of Genesis also follow an exponential growth pattern. As Humphreys suggested, the primordial material of the Day 1 earth may have been water,[66] later being formed into the heavier elements later on the creation week. From the Genesis 1 narrative, we can determine some of the elements necessary for certain created object to exist. For example, from what I have described as Day 0, we have light particles, presumably photons. On Day 1 there is God dividing this light from the darkness. In modern times, the Sun fulfills this task and it is mostly hydrogen and helium, the first two elements of the periodic table. But before the Sun existed, among the waters below, these two elements may have served the same purpose, but in a different way. Figure 6 lists elements implicit with the created objects brought out on Days 1 through 3.

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[63] Hughes-Hallet, "Calculus," 41.
[64] White, "Billions of People,"
[65] Johnson and Brook, "Reconstructing," 8.
[66] Humphreys, "Starlight and Time" 33.

Day 1 of Creation: Light	**Comment**
Period 1 of the Periodic Table of Elements	*Principle quantum number n = 1*
Atomic Number 1, Hydrogen	Fuels the Sun, our current source of light
Atomic Number 2, Helium	Fuels the Sun, our current source of light
Day 2 of Creation: Firmament and Sky	
Period 2 of the Periodic Table of Elements	*Principle quantum number n = 2*
Atomic Number 6, Carbon	Atmospheric Gas: CO_2
Atomic Number 7, Nitrogen	Atmospheric Gas, N_2
Atomic Number 8, Oxygen	Atmospheric Gas, O_2, O_3, Water, H_2O
Atomic Number 10, Neon	Atmospheric Noble Gas
Day 3 of Creation: Seas and Dry Earth	
Period 3 of the Periodic Table of Elements	*Principle quantum number n = 3*
Atomic Number 11, Sodium	6th most abundant metal of earth's crust
Atomic Number 12, Magnesium	7th most abundant metal of earth's crust
Atomic Number 13, Aluminum	3rd most abundant metal of earth's crust
Atomic Number 14, Silicon	2nd most abundant (semi)metal of earth's crust
Atomic Number 15, Phosphorus	An abundant non-metal of earth's crust
Atomic Number 16, Sulfur	An abundant non-metal of earth's crust
Atomic Number 17, Chlorine	An abundant non-metal of earth's crust
Atomic Number 18, Argon	Atmospheric Noble Gas
"3d-orbital" of the PTOE continues earth elements of Day 3	*Principle quantum number n = 3*
Atomic Number 22, Titanium	An abundant metal of earth's crust
Atomic Number 23, Vanadium	An abundant metal of earth's crust
Atomic Number 24, Chromium	An abundant metal of earth's crust
Atomic Number 25, Manganese	An abundant metal of earth's crust
Atomic Number 26, Iron	4th most abundant metal of earth's crust
Atomic Number 27, Cobalt	An abundant metal of earth's crust
Atomic Number 28, Nickel	An abundant metal of earth
Atomic Number 29, Copper	An abundant metal of earth
Atomic Number 30, Zinc	An abundant metal of earth
End "3d-orbital" of Periodic Table of Elements	Elemental abundances, on average, drop off severely after Atomic Number 30, Zinc

Figure 6. Chemical Elements and the Creation Days in which they are Implicit

From Figure 6, we see that the chemical elements implicit with their respective creation day follow the periods 1-3 of the periodic table of the elements. This periodicity seems to follow the principal quantum number *n* on which the Periodic Table of the Elements is arranged, with its sub-orbitals *s, p, d,* occurring in regular patterns as the periods repeat. This is most evident in the second portion of Day 3, during which more elements abundant in the earth's crust are brought forth in the periodic table's 3*d* orbital. This is consistent with our earlier examination of the harmonic series which forms the mathematical basis of the principal quantum numbers. This second portion of Day 3 ends with atomic number 30, Zinc. It is noteworthy that elemental abundances in the earth's crust diminish greatly on average after atomic number 30.

In Figure 7, I have plotted the numerical progression of the Periodic Table of the elements as brought out by the first three days of creation. I have divided each day in half, i.e., Day 1, Day 1.5, Day 2, Day 2.5, etc., to follow the text narrative of "the evening and the morning." I find that the Periodic Table data as brought forth during creation week fit best with the base *e* exponential function and the Harmonic Series, whose time-interval ratios approximate *e*.

Day	PTOE	Exp, e^Day	Power, Day^2	Power, Day^3	Linear, 2*Day	Harmonic
0	0	1.0	0	0	0	1
1	1	2.7	1	1	2	2
1.5	2	4.5	2.25	3.375	3	4
2	7	7.4	4	8	4	7
2.5	10	12.2	6.25	15.625	5	11
3	18	20.1	9	27	6	19
3.5	30	33.1	12.25	42.875	7	31
R^2		0.9954394	0.971866744	0.994253419	0.90362239	0.996732

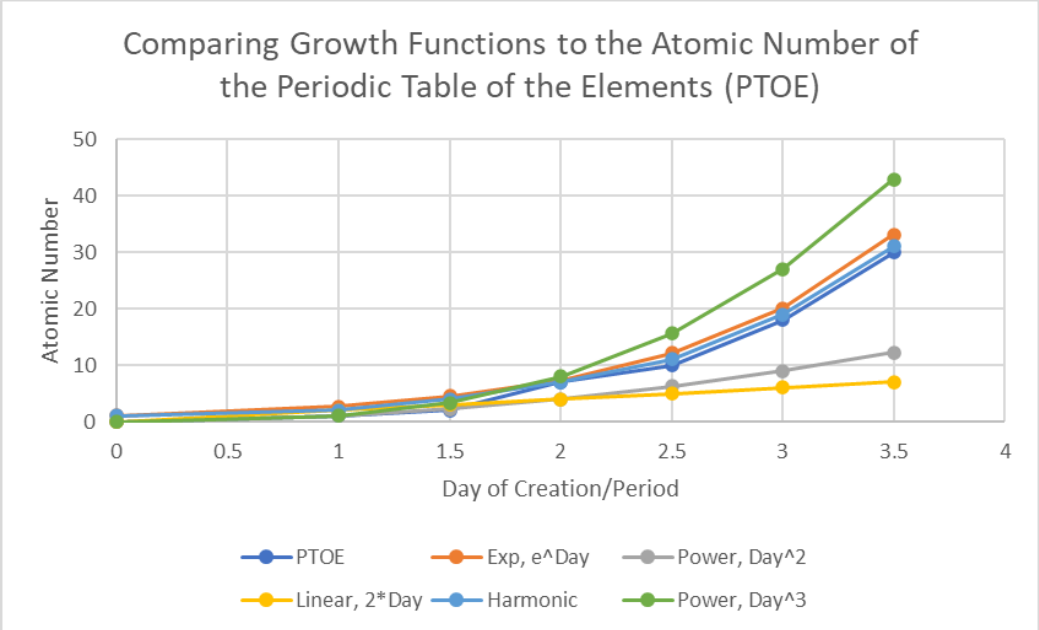

Figure 7. Comparing numerical progression of the Periodic Table of Elements (PTOE) to growth functions found in Genesis 1

Self-Similarity: *"…whose seed is within itself…" Genesis 1:11*

Perhaps the most important and complex mathematical principle we see in Genesis 1 is that of self-similarity. One aspect of self-similarity is "one-to-one correspondence" with man having been created the image of God. Another property of self-similarity is that mechanism which allows organisms to grow and reproduce. A self-similar pattern is one for which at any scale of observation, the pattern remains the same. Patterns such as these are also called "fractal" patterns. Lisle states that structures that have "an infinite number of smaller versions of itself, built into itself" is a fractal.[67]

One-to-One Correspondence

In Genesis 1, God created man in his own image.[68] Later, Christ said "he that hath seen me hath seen the Father…"[69] Regarding man being the image of God, Ham states:

> When scripture describes all of God's attributes, it is in the context of God being the perfection of such attributes. For example, God is love, and God's love is perfect. Humanity shares many of God's attributes, and we were originally created to reflect God's perfect character in righteousness and holiness.[70]

Although we have no way to determine the exact nature of this correspondence to which God is referring, there is a mathematical principle from set theory pertinent to the discussion. A set *X* is said to have one-to-one correspondence, or bijection with set *Y* if a function *f*: X → Y is both injective and surjective:[71]

(22) $A\ function\ f: X \rightarrow Y\ is\ called\ injective\ if, for\ all\ x_1 \in X, x_2 \in X, x_1 \neq x_2\ implies\ that\ f(x_1) \neq f(x_2).$

(23) $A\ function\ f: X \rightarrow Y\ is\ called\ surjective\ if, for\ all\ y \in Y,$ $there\ exists\ x \in X\ such\ that\ f(x) = y$

To illustrate, every counting number *N*, is a member of the set of real numbers *R*. And since no pair of counting numbers map to a single real number, the correspondence of *N* to *R* is injective. However, not every member of the real numbers map to a counting number, meaning their correspondence is *not* surjective, even though both *N* and *R* contain infinite members. Therefore, the relation between the counting numbers and the real numbers is not bijective. Consider these two passages: "Now the parable is this: The seed is the Word of God..."[72] and "he that hath seen me hath seen the Father…"[73] It would seem that one could consider the relationship between Jesus Christ and God the Father in terms of injectivity, surjectivity, and bijectivity. Christ said "I and my father are one."[74] Is there a one-to-one correspondence between God, Jesus, and the Holy Spirit? While remaining within the boundaries of Scripture, it is an interesting question to ponder.

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[67] Lisle, "Fractals," 23.
[68] Genesis 1:27, KJV
[69] John 14:9, KJV
[70] Ham, "What is the Image of God," 6.
[71] Houston, "How to Think Like a Mathematician," 218-220.
[72] Luke 8:11, KJV
[73] John 14:9, KJV
[74] John 10:30, KJV

The Fractal of Life: The Logarithmic Spiral

Another facet of self-similarity is related to how organisms grow and maintain proportion. One mathematical pattern we observe in nature is the logarithmic spiral. This shape is seen at all scales of existence and has been investigated in many fields of science, including but not limited to astronomy, botany, microbiology, anatomy, mathematics, physics, zoology, and conchology. The ubiquitous spiral pattern seen in creation is an elegant reminder that God created the heavens and the earth. As a pattern of proportional growth, it allows for life to continue even as an organism is forming. As said earlier, the logarithmic spiral is considered a fractal because it is self-similar. The self-similarity arises from a property of logarithmic spirals referred to as equiangularity. Thompson defines it this way:

> Any [plane] curve proceeding from a fixed point (which is called the pole), and such that the arc intercepted between any two radii at a given angle to one another is always similar to itself, is called an equiangular, or logarithmic spiral.[75]

It is this special angle that allows the spiral to grow and keep its proportion. For example, when a circle grows, it maintains proportion because the angle representing the direction of growth versus a tangent line is a constant 90°. Similarly, for a logarithmic spiral, as in Figure 8, angle theta remains constant for all r_n. As with other fractals, a self-similar pattern such as this will remain constant at all scales of observation. This may be applied to Genesis 1:11 which reads "And God said, Let the earth bring forth grass, the herb yielding seed, and the fruit tree yielding fruit after its kind, whose seed is in itself, upon the earth, and it and so." The terms "after its kind" and "seed in itself" are both examples of self-similarity in Genesis 1.

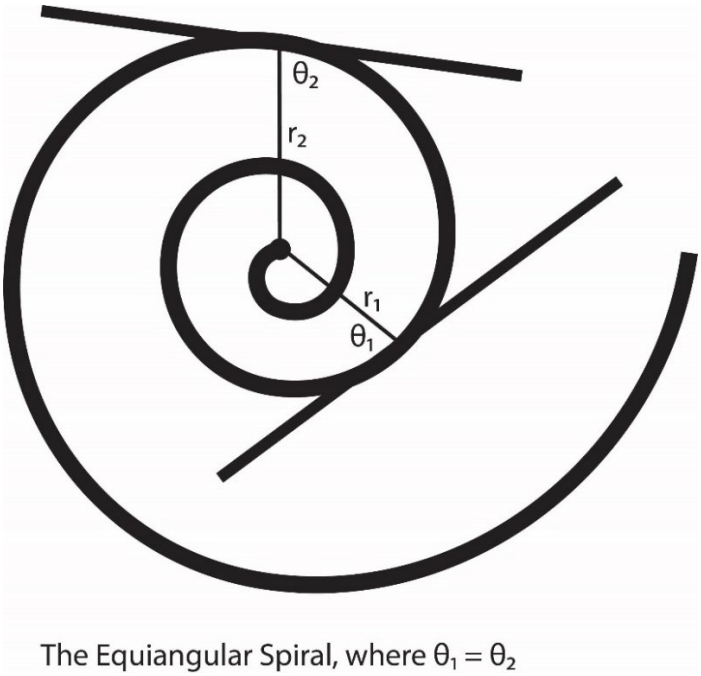


Figure 8. Illustrating the proportions of the equiangular, logarithmic spiral. For any r, the angle formed with its associated tangent line is constant. Similar to the shape of the Nautilus shell, this pattern allows for growth while keeping proportion.

[75] Thompson, "On Growth and Form," 179.

Spiral and Sinusoidal Wave: Plotting the harmonic series using the natural base *e*

Another unique feature of the natural base *e* made famous by Leonhard Euler was published in his work *Introducio in analysin infinitorum* in 1748.[76] The Euler formula for the trigonometric functions:

(24) $e^{ix} = \cos x + i \sin x$, where x is an angle in radians and $i = \sqrt{-1}$

(25) $e^{\pi i} + 1 = 0$

For angle 0 to 2π radians, the Euler formula creates a helical unit circle in the complex plane and a sinusoidal wave pattern in the real plane, as shown in Figure 9. The significance and beauty of this identity is beyond the scope of this paper. Of the Euler formula (25), Maor states:

> It must surely rank among the most beautiful formulas in all of mathematics…a formula that connects the five most important constants of mathematics (and also the three most important mathematical operations—addition, multiplication and exponentiation). These five constants symbolize the four major branches of classical mathematics: arithmetic, represented by 0 and 1, algebra, by *i*; geometry, by π; and analysis, by *e*.

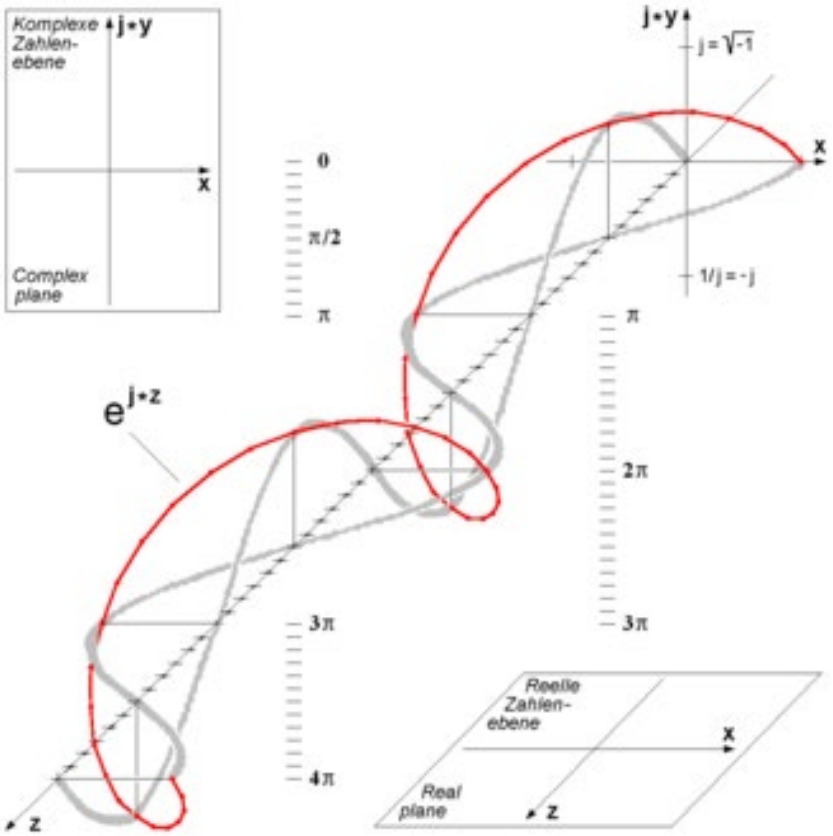


Figure 9. The 3-D plot of the Euler identity creates both a spiral and sinusoidal pattern.

[76] Maor, "E: The Story of a Number," 155.

It is well that we are examining such a fundamental mathematical identity in the context of Genesis creation. The formula is of great interest to me because with the same fundamental constant defined earlier in creation, I can plot the harmonic series, whose ratios of partial sums also approximate *e*, as shown in Figure 4. This plot is showing the complex plane only, but referring back to Figure 9, the series will also have a sinusoidal real component plot coming out of the page. Therefore, I obtain both a spiral pattern I use for analysis, but I also get the sinusoidal harmonic patterns of Figure 3. We plot the partial sums S_n obtained from the harmonic series equation (14) for n = 1 to 31 using Euler's formula for trigonometric functions:

$$ne^{i2\pi S_n} = n\cos\left[2\pi\,[S_n]\right] + n\,i\,\sin[2\pi\,[S_n]] \tag{26}$$

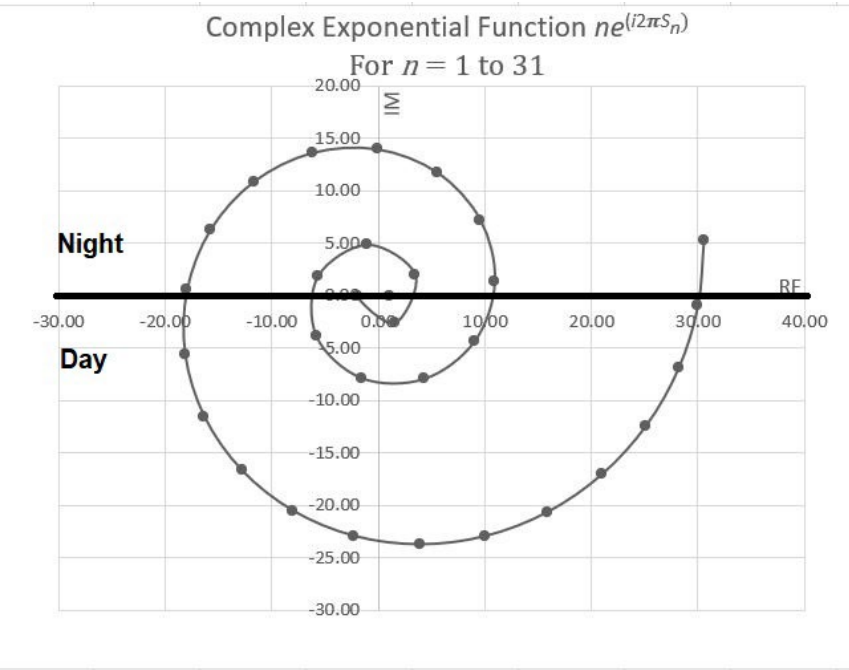


Figure 10. The partial sums obtained from the harmonic series form a logarithmic spiral pattern when plotted using Euler's formula for trigonometric functions.

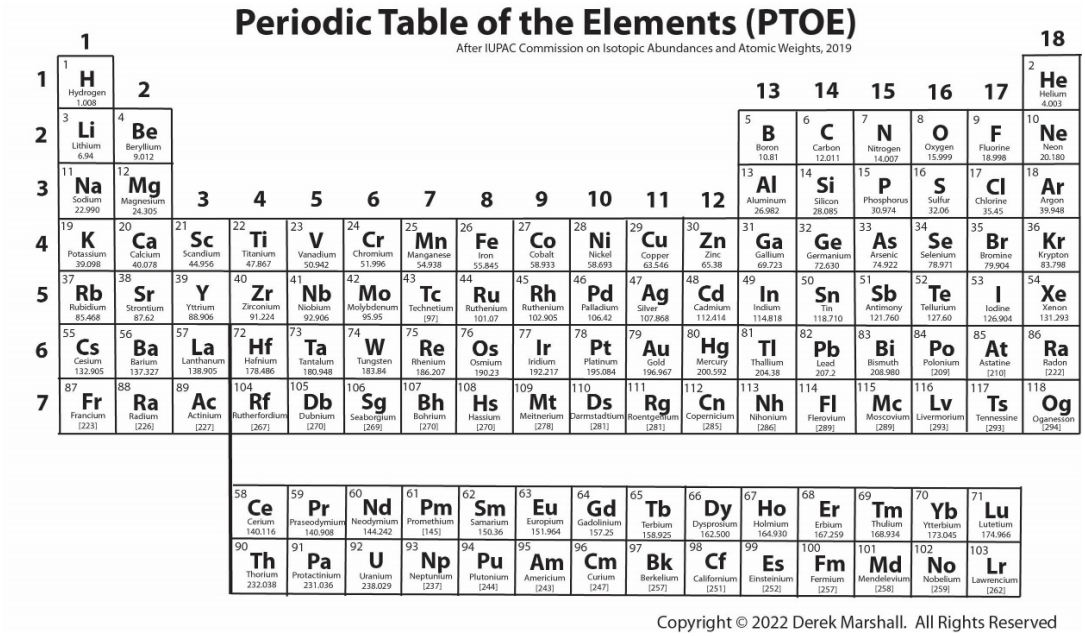
We arbitrarily limited the parametric plot of equation (26) to n = 1, 2, 3, …, 31 for the sake of clarity, with the understanding that plotting the full six days and nights would require the full sequence n = 1, 2, 3, …, 616, from Figure 5. With this plot, we obtain an equiangular, logarithmic spiral pattern which keeps its proportion as it grows.[77] Also with this rotating pattern, we can have a visual interpretation of the partial sums of Figure 5 representing half-days of creation. In the table, each partial sum S_n translates to a half-rotation of the spiral in Figure 10, as it is developed from the same data. As such, the *x*-axis (labelled RE in Figure 10) could represent a DAY/NIGHT line with each half-rotation of the spiral representing a half-day of creation. As in Figure 5, tabulating the value of *n* each time the spiral approaches the DAY/NIGHT line yields some very interesting data. Because the spiral pattern is so frequently observed in creation, having a mathematical based upon the fractal which was obtained directly from the Genesis creation account could be extremely useful. For example, on the fourth day of creation God placed lights in the firmament. These lights were meant to be "for signs, and for seasons, and for days, and

[77] Thompson, "On Growth and Form," 179.

years:"[78] One sign we see in the night sky is that of spiral galaxies. The fact that these galaxies remain so well-formed is evidence of a young creation.[79] Because own Milky Way galaxy is a spiral galaxy, having a creation model that is spiral-based and mathematical could be an asset in understanding the basis of galactic structure.

Harmonic series spiral zero-crossings correspond to Periodic Table of the Elements

Earlier in Figure 7, we plotted several growth patterns alongside the creation data obtained from the Genesis 1. In the column labelled "PTOE" I plotted the atomic numbers that correspond to what was created on that specific day. We saw that the plots corresponding to the Euler number *e* had the best correlation to the creation periodic table. The best R^2 value came from the harmonic series data. Now with the spiral plot in Figure 10, we can see the actual interactions between the harmonic series data and the DAY-NIGHT line. For example, the last plot on the Day side for the first rotation of Day 1 occurs at $n = 3$. This corresponds to the end of the first period of the periodic table and the beginning of the second period. Since these are integer values and the first rotation of the spiral is quite obtuse, I must abide with the data plots not arriving exactly on the DAY-NIGHT line. Day 2 ends at $n = 10$, corresponding to the end of period 2 of the periodic table. Night 3 ends at $n = 18$, corresponding to the end of period 3 of the periodic table. And finally, Day 3, ends at $n = 30$ corresponding to the end of the 3d sub-orbital of the 4th period of the periodic table. I recognize a pattern change on Day 4 as the Earth is finished and God begins placing lights in the firmament which we now recognize as terrestrial and celestial objects, such as planets, stars, galaxies, etc. On and after the 4th period of the table of elements, we see repeated patterns of 18 in the periodic table. Here in periods four and five the table is filling 18-electron M shell, of the shell model of electron orbitals. This may correspond to the distinction made on Day Six in Genesis 1:24 "let the earth bring forth…" as dry land was being created on Night 3, which relates to n = 18 on the spiral. As these creatures are created from earth, God is using elements from Day 3.



[78] Genesis 1:14 KJV

[79] Faulkner, "Galaxies—Unexplained Spirals," 1.

Conclusion

In this paper, we discussed seven mathematical principles obtained directly from the Genesis 1 narrative. We found that many of these principles are stated or used explicitly as in "multiply" and "divide" or implicit in what was created from the perspective of the periodic table of the elements. These mathematical ideas are brought out in such fashion that they build upon each other as creation is being formed. In the beginning, an origin is established and a system of ordinal and cardinal numbers is defined. With ordinality brings sequence and series, coupled with the Creators prolific use of the word "and" in the narrative. With division, the series that arises from the narrative is the inverse factorial sequence that which defines *e*, the natural logarithmic base. Concurrently with the series definition of *e*, and division, the harmonic series is established which is the basis of quantized energy. With God's charge to "be fruitful and multiply" on Day six we found that population growth can be modeled using the same natural logarithmic base *e* that was defined earlier in creation. In addition, we found that the first three periods of the periodic table of the elements follow a similar exponential growth pattern based upon the logarithmic natural base *e*. Finally, we examined the self-similar patterns suggested by the ideas of being created in the image of God, i.e., one-to-one correspondence and God's having embedded a self-similar seed within each creation that has life. Self-similarity is a mathematical principle seen in fractal mathematics and specifically in the equiangular logarithmic spiral pattern. Combining the complex trigonometric identity of *e* with the harmonic series, we were able to obtain a logarithmic spiral pattern which also correlates to the first three periods of the periodic table of elements. Therefore, I conclude that Genesis chapter one exhibits sufficient interrelated mathematical principles to be referred to as God's language of creation.

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