Dickinson and Mathematics

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Mathematics is among the many subjects in which Emily Dickinson was well schooled. It was part of her curriculum at Amherst Academy, where the syllabus included texts like Day’s Algebra, Playfair’s Euclid, and Adams’s Arithmetic (Wolff 564). It was also part of the curriculum at Mount Holyoke Female Seminary, where she passed an examination on Euclidean geometry “without a failure at any time” (Habegger 195). By her own account, Dickinson found the study of mathematics intellectually stimulating. “Logarithm - had I - for Drink / ’Twas a dry Wine” (Fr754), she reminisces in “Let Us play Yesterday,” depicting the concept of exponential power here not as an abstraction but as a flavorful intoxicant. And in an 1851 letter to Susan Gilbert, she portrays yet another mathematical concept – the algebraic formula for expanding the powers of sums – as something palpable, voluptuous, and alive: “I fancy you very often descending to the schoolroom with a plump Binomial Theorem struggling in your hand” (L56).

Not only did Dickinson find mathematics intellectually stimulating, but she frequently incorporated mathematical language into her poetic diction. As Gary Lee Stonum has pointed out, “Roughly two hundred of Dickinson’s poems include some reference to mathematical terms and ideas,” while “a number of others implicitly depend on counting, measuring, and quantitatively assessing” (133).

Critical approaches to the place of mathematics in Dickinson’s work have been exciting and rich. Stonum has explored the relationship between mathematics and egalitarianism in Dickinson’s poetry (133-141). Greg Johnson has interpreted Dickinson’s mathematical vocabulary in light of the contradiction between her empiricism and her mysticism. Cynthia Griffin Wolff has studied the link be-
tween Dickinson’s mathematical schooling and her religious upbringing (79, 94, 192, 194). Stephen Cushman has investigated Dickinson’s mathematical figures alongside her commitment to deconstructing poetic form. James R. Guthrie has analyzed Dickinson’s mathematical tropes in connection to her use of Eucharistic language. And Michael Theune has theorized that Dickinson employed arithmetical symbols to illustrate her skepticism of holistic world views like Transcendentalism. But while approaches to Dickinson’s mathematics have been diverse, scholars are more or less united by an inclination to view mathematical logic as ultimately incompatible with Dickinson’s poetic intentions. Guthrie, for example, claims that Dickinson found mathematics to be “hopelessly inadequate to the task of describing the symbolic function she imagined herself fulfilling as poet” (127). Similarly, Cushman writes that Dickinson’s poetic forms “do not locate themselves within the harmoniously mathematical framework of nature” (48). Theune discourages readers from attributing too much significance to the presence of mathematical language in Dickinson’s poetry: “at best,” he writes, “Dickinson employs mathematics suggestively, impressionistically, more as a collage than as a definitive structure” (112). And Johnson, alluding to Dickinson’s phrase “broken mathematics” (Fr78), depicts mathematics as “a system which is surely ‘broken’ in its inability to prove [Dickinson’s] speculations” (89).

Dickinson certainly does at times experiment with “broken” mathematics; more specifically, she creates aesthetic puzzles by “breaking” mathematical rules. In “One and One - are One,” for example, she disables the principle of addition in order to reiterate the capitalized letter “O,” whose visual resemblance to the cipher “0” re-enciphers the poem’s already cryptic equation between “1 + 1” and “1” (Fr497). Elsewhere in her writing, however, Dickinson employs “unbroken” mathematical concepts; moreover, she deploys these concepts not “suggestively” or “impressionistically” but accurately, logically, and with tremendous care. In what follows, I argue that the exactness of mathematical language often allowed Dickinson to formalize how she thought and felt about ineffable subjects. Focusing on poems that observe her own mandate to “Deal with the soul / As with Algebra!” (Fr240), I will analyze some of the ways in which Dickinson uses specific mathematical principles to account for mysteries like death, wonder, the relation of self to God, and the limits of human knowledge. In doing so, I hope to show that the nature of mathematics was fully consonant with Dickinson’s lyric sensibility. Not only did she have a poetic understanding of mathematics, but she had a deeply mathematical understanding of her own poetic enterprise.
The most conspicuous instance of Dickinson’s mathematical imagination is her attraction to the figure of the circle. The word “circumference” – from the Latin verb “circumfero,” to carry around – appears over and over again in her writing. In an 1862 letter to Thomas Wentworth Higginson, she famously invokes this word to describe her art: “My Business is Circumference” (L268). And in her poetry she brings “circumference” to bear on subjects as diverse as intense physical suffering (“Pain - expands the Time - / Ages coil within / The minute Circumference / Of a single Brain” [Fr833]), the mesmerizing flight of a butterfly (“Her pretty Parasol […] to Nowhere - seemed to go / In purposeless Circumference” [Fr610]), and the spectacle of nightfall (“An ignorance a Sunset / Confer opon the Eye - / Of territory - Color - / Circumference - Decay” [Fr669]).

Readers have tended to construe Dickinson’s circumference less as a mathematical figure and more as a lyrically resonant image of encompassment. Albert Gelpi, for instance, has suggested that circumference was Dickinson’s “most frequent metaphor for ecstasy” (120). He discusses Dickinson’s circumference in the context of other American thinkers who relied on the figure of the circle as a means of imagining the relation of self to eternity:

In Dickinson, as in Emerson and Thoreau, eternity and infinity and God Himself can best be taken as the encircling infinity into which the individual may expand in accordance with his inner capacity . . . . Circumference comes to serve as a complex symbol for those disrupted moments when in some sense time transcends time. Circumference signifies ecstasy in its expansiveness, in its self-contained wholeness. (122-123)

What makes the figure of circumference so powerful, Gelpi explains, is its double or paradoxical nature as both finite limit and infinite extension. According to Gelpi, Dickinson regarded this paradoxical nature as analogous to the paradoxical experience of ecstasy, whereby the self is simultaneously inside and outside of its own self. Gary Lee Stonum has similarly focused on the double nature of circumference, arguing that Dickinson used this doubleness to mediate between poem and reader. Her figures of circumference “interpose themselves against naturally sublime presences,” Stonum writes, “thereby presenting themselves to us perhaps defenseless readers as instances of a sublimity with which we are solicited to identify in our turn” (139). In other words, circumference represents Dickinson’s poetry as neither exclusive nor inclusive – neither overpoweringly sublime nor readily accessible – but somewhere in between.
A number of Dickinson’s “circumference poems” do invite the kinds of readings proposed by Gelpi and Stonum – readings that are loosely rather than precisely mathematical. Consider, for example, “I saw no Way - The Heavens were stitched”:

I saw no Way - The Heavens were stitched -
I felt the Columns close -
The Earth reversed her Hemispheres -
I touched the Universe -

And back it slid - and I alone -
A Speck opon a Ball -
Went out opon Circumference -
Beyond the Dip of Bell -

(Fr633)

These stanzas use the double nature of circumference to evoke the paradoxical sensations that accompany ecstasy. Each stanza corresponds to one half of this double nature. In the first stanza, the ecstatic subject is coextensive with the planet earth. More specifically, the paratactic juxtaposition between the third and fourth lines – “The Earth reversed her Hemispheres / I touched the Universe” – frames “The Earth” as parallel in size to the lyric “I.” United in circumference, self and world share the same proportions, the same expansive scope. To undergo ecstasy, Dickinson suggests here, is to transcend one’s individuality and attain a state of mind as all-encompassing as the world itself. In the second stanza, the proportion of the lyric speaker to the earth undergoes a dramatic change. The lyric “I” becomes a mere “Speck opon a Ball”; that is, it becomes just one of the infinitely extendable quantity of zero-dimensional points that make up the surface – the circumference – of the globe. Yet this experience of zero-dimensionality is no less transcendent than the experience of magnitude described in the first stanza. Indeed, it is in the second stanza that the lyric “I” gets carried away and vanishes beyond the horizon of the poem. In the poem’s loosely mathematical scheme, the double nature of circumference – finite limit and infinite extension – resonates with the ecstatic experience of being at once central and peripheral to the cosmic order.

To Dickinson, however, circumference was more than a loosely mathematical figure transcending the dichotomy between finiteness and infinity. It was also part of a geometric formula. As her poem “Time feels so vast” shows, this formula
allowed Dickinson to create a numerically precise account of a truth that she found difficult to communicate using words alone.

Time feels so vast that were it not
For an Eternity -
I fear me this Circumference
Engross my Finity -

To His exclusion, who prepare
By Processes of Size
For the Stupendous Vision
Of His Diameters -

(Fr858)

These stanzas are about the relationship between temporality and eternity, and Dickinson characterizes both entities in mathematical terms. Temporality is “this Circumference,” which threatens to circumscribe the lyric speaker within the world of mortal experience. Eternity – the realm of God – is composed of “His Diameters,” which the speaker hopes eventually to behold in a “Stupendous Vision” after death. By the word “circumference” Dickinson has in mind the curved line that forms the boundary of a circle, and by the word “diameter” she has in mind the straight line that passes through the center of a circle and terminates at the circle’s perimeter. The relationship between circumference and diameter that Dickinson has in mind, however, is not a geometrical shape but rather a specific number. The ratio of the circumference of a circle to its diameter – that is, circumference divided by diameter – equals pi, an irrational number that appears as a constant in many mathematical expressions. No matter how large or how small a given circle may be, this number will always characterize the proportion between the circle’s circumference and diameter. Like all other irrational numbers, pi cannot be written as a whole number or as the ratio of two whole numbers. In decimal form, it goes on forever without repeating itself or revealing a pattern. To calculate pi to its last decimal place would therefore be impossible, but the number can be rendered approximately as 3.14159265358979323. Hence, the ratio of circumference to diameter is expressible as the following formula:
Notice how the structure of this formula corresponds to the structure of Dickinson’s poem. Both formula and poem, more specifically, are expressions of the relationship between circumference and diameter. By representing the relationship of temporality to eternity in terms of the ratio of the circumference of a circle to its diameter, the poem represents the relationship between temporality and eternity as the number pi:

\[
\frac{\text{temporality}}{\text{eternity}} = \frac{\text{“this Circumference”}}{\text{“His Diameters”}} = 3.14159265358979323…
\]

Yet such a figuration is complicated by the fact that the lone circle whose circumference appears in the first stanza is not quite identical to the multitude of circles or spheres whose plural diameters appear in the second stanza. By using the phrase “Processes of Size” in the poem’s sixth line, Dickinson illustrates the place of temporality within eternity in terms of an ever-blossoming series of concentric circles. It is no coincidence that Emerson invokes a nearly identical image in the famous opening sentences of his 1841 essay “Circles”:

> The eye is the first circle; the horizon which it forms is the second; and throughout nature this primary figure is repeated without end. It is the highest emblem in the cipher of the world. Saint Augustine described the nature of God as a circle whose center was everywhere and its circumference nowhere. We are all our lifetime reading the copious sense of this first of forms. […] Our life is an apprenticeship to the truth that around every circle another can be drawn. (189)

As Gelpi has remarked, Dickinson shared Emerson’s Augustinian conception of God: she imagined eternity as “Circumference without Relief - / Or Estimate - Or End -” and “Center, there, all the time” (122). From this perspective, the ratio of temporality (the finite circumference of the lyric speaker’s mortal life) to eternity (the infinite diameters of a circle whose center is everywhere and whose circumference is nowhere) equals not pi but rather the ratio of a finite number to infinity – a ratio that necessarily yields an infinitesimal number. Dickinson allows for both ratios to coexist. Whether the quotient obtained by the division of these stanzas is
3.14159265358979323… or a number that verges on zero, “Time feels so vast” uses mathematics to describe the relationship of time to eternity as something both infinitely elusive and infinitely approachable. We may not be able to comprehend this relationship in its entirety – after all, we will never locate the final decimal place of pi – but we comprehend its truth as perfectly as we comprehend the truth of a mathematical constant. Understood in this light, the poem complicates Guthrie’s claim that “Dickinson employed the idea of ratios in her poems as part of a larger project to compare earth to heaven, in order to discover which of the two might satisfy her emotional and intellectual requirements more thoroughly” (122). In “Time feels so vast,” Dickinson employs the idea of ratios in order to define the relationship between earth and heaven – the quotient, the proportion itself – as emotionally and intellectually satisfying.

“The Angle of a Landscape” is another mathematical poem in which Dickinson meditates on the nature of temporality. Once again she invokes the figure of the circle in a strictly geometrical way. This time, however, ratios do not have a part in her mathematical framework. And her focus is less on the unchanging nature of objective realities and more on the subjective experience of change itself.

The Angle of a Landscape -
That every time I wake -
Between my Curtain and the Wall
Opon an ample Crack -

Like a Venetian - waiting -
Accosts my open eye -
Is just a Bough of Apples -
Held slanting, in the Sky -

The Pattern of a Chimney -
The Forehead of a Hill -
Sometimes - a Vane’s Forefinger -
But that’s - Occasional -

The Seasons - shift - my Picture -
Opon my Emerald Bough,
I wake - to find no - Emeralds -
Then - Diamonds - which the Snow
From Polar Caskets - fetched me -  
The Chimney - and the Hill -  
And just the Steeple's finger -  
These - never stir at all -

(Fr578)

The words “Angle” and “Polar” are key to a mathematical understanding of this poem. Both have non-mathematical meanings that are obviously at work here: “angle” refers to the position from which the landscape is presented to the poet’s view, and “polar” refers to cold weather from the North Pole. But these words have specific mathematical meanings as well. In geometry, “angle” refers to the figure formed by two lines diverging from a common point. “Polar,” meanwhile, refers to what is known in mathematics as the polar angle or polar coordinate system. A polar coordinate is either of two coordinates that together specify the location of a point in a plane with reference to a fixed line (that is, a “polar axis”) and a fixed point (“Ø” or “point of origin”) inside the fixed line. One of these two coordinates is the length of the radius drawn from “Ø” to the point being specified. The other coordinate is the angle which this radius makes with the polar axis. In the following diagram, for example, the polar coordinates of point P are (r, x) where “r” denotes the length of the radius, and “x” denotes the polar angle.

“Tell all the truth but tell it slant - / Success in Circuit lies” (Fr1263), Dickinson once aphorized. In the polar angle system diagrammed above, slantness and circumference overlap much as they do in Dickinson’s aphorism. “The Angle of a Landscape” uses the polar angle to “Tell all the truth” about the intricate sensation of
wonder that one can experience while staring out a window and reflecting on the
cycle of seasonal transformation. Every detail in the poem corresponds to an ele-
ment of the polar coordinate system. “[M]y open eye” corresponds to the point of
origin \(O\). “[M]y Curtain” corresponds to the polar axis. “[T]he Wall” corresponds
to the radius. The “Angle of a Landscape” – the “ample Crack” formed “Between
my Curtain and the Wall” – corresponds to the polar angle \(\theta\). The rooftop in the
distance – “The Chimney - and the Hill - / And just the Steeple’s finger” – corre-
spends to the point \(P\) whose coordinates “never stir at all.” And the cycle of the
seasons generated both by the orbit of the earth around the sun and by the tilt of
the earth’s axis corresponds to the principle of circularity around which the polar
angle system revolves.

An interesting picture emerges from this framework. Here, the lyric speaker
– a vertex locked inside an angle whose degrees will never change – comes across
as strangely passive and inert. Our notion of her as a static entity is strengthened
by the fact that the only verb assigned to her is “wake.” Her sole actions, in other
words, consist of keeping her eyes open and remaining conscious of what she
beholds. Meanwhile, the outside world – the world beyond the angle of the lyric
speaker – is actively changing all the time. The busy cycle of the seasons kaleido-
scopically shifts the contents of “the Angle of a Landscape” from summer “Em-
eralds” to winter “Diamonds” and from winter diamonds back to summer emer-
alds, over and over again, year after year. But what Dickinson really wants us to
see is how the rotation of the seasons creates the perspectival illusion that the “I”
is moving while the world of change is staying still. This illusion is reflected most
vividly in lines sixteen and seventeen, where the speaker views the “Diamonds
- which the Snow // From Polar Caskets - fetched me.” While these lines describe
the snow as fetching diamonds to the lyric speaker from polar caskets, the descrip-
tion is complicated by the jumbled form in which it occurs. The grammatical case
of each word is not immediately clear: “Diamonds,” for instance, seems at first to
take place in the nominative case. The description is broken not only syntactically
but also poetically, by a break in stanza. The dashes, moreover, add to the effect of
disorder in these lines. “Diamonds,” “Snow,” “Polar Caskets,” and “fetched me”
behave less like syntactic units and more like bits of colored glass in a kaleido-
scope, the same kaleidoscope evoked by the rotation of the seasons. In this context,
the place – the grammatical case – of the word “me” is unstable. Consequently, the
line “From Polar Caskets - fetched me” gives the impression that the “me” herself
is being “fetched” in “Polar Caskets,” both turned and returned. Although the
lyric speaker is frozen in the “Polar Casket” of her polar angle, from her “angle” or point of view she is also being spun through a course of unending motion. Thus transported by the cycle of the seasons, the lyric “me” transcends its fixed angle and achieves a panoramic understanding of time and change. In short, Dickinson uses the polar angle to choreograph the reader’s attention in ways that coincide with the poet’s own feelings of wonder, wonder at seasons whose cyclicity implies that time has neither beginning nor end.

The circle is not the only mathematical figure that Dickinson found powerful. She was also drawn to what in mathematics is known as the asymptote, a line whose distance to a given curve approaches but never reaches zero. Dickinson frequently employed this figure to address the limits and possibilities of human knowledge and perception. In “I had a daily Bliss,” for example, she employs asymptotes to depict her nostalgia for childhood emotions that are no longer available to her.

I had a daily Bliss
I half indifferent viewed
Till sudden I perceived it stir -
It grew as I pursued

Till when around a Hight
It wasted from my sight
Increased beyond my utmost scope
I learned to estimate -

(Fr1029)

This poem is about the loss entailed by the process of growing older – the loss of innocence, the loss of ecstasy, the loss of bliss. As Greg Johnson has cogently explained, Dickinson describes this loss “in terms of a ratio”: “the more she pursued her lost prize,” he writes, “the more its value increased. Ultimately the loss was complete, the bliss going completely out of her sight, and by now its value had increased beyond her ability to measure in earthly terms” (90). What Johnson leaves unexplored, however, is the precise way in which the poem uses the concept of ratios to create its imagery of loss. As the following diagram shows, the imagery itself is mathematical.
This is a visual representation of the mathematical function \( y = \frac{1}{x} \), with the variable \( x \) consisting exclusively of positive numbers. The greater the value of \( x \), the smaller the value of \( y \) and vice versa. Neither variable can ever equal zero: 1 cannot be divided by zero, and a ratio with 1 as its numerator cannot yield zero as a quotient. What results, graphically speaking, is a curve enclosed by both a horizontal asymptote (the \( x \)-axis) and a vertical asymptote (the \( y \)-axis). It is within the framework of this graph that the narrative logic of Dickinson’s poem takes its place. Here, \( x \) corresponds to the age of the lyric “I,” while \( y \) corresponds to her capacity for bliss. These two elements – \( x \) and \( y \), age and bliss – exist in inverse relationship to each other, generating a curve that delineates the speaker’s ever-dwindling innocence. When the speaker was very young – when \( x \) was close to zero – she was capable of experiencing unthinkable heights of unadulterated ecstasy. But as she has grown older – as the value of \( x \) has increased – her capacity for such innocent ecstasy has declined. Precipitous at first, the fall from innocence has become more and more gradual with the passage of time. Soon enough there will be virtually no more heights of ecstasy left from which to fall.

Yet the curve is more than a figure for the speaker’s dwindling capacity for bliss. It is also (and more importantly) a figure for the speaker’s retrospective perception of what she has lost. As Cynthia Griffin Wolff has noted, Dickinson often measured the preciousness of something in terms of its remoteness: “the farther away it was, the more valuable it was” (194). Accordingly, the worth of lost bliss in
this poem grows higher the farther back it recedes into the past and away from the present moment. The $y$-axis, the vertical asymptote toward which the retrospective curve aspires, represents a state of bliss so primal, so far back in time, that its value is immeasurably high. To the rapidly aging lyric speaker, curve and asymptote already look like the same thing: receding into the distance, the remembered ecstasy of her youth has attained a “Hight” where it has nearly “wasted from my sight” and “Increased beyond my utmost scope.” But the lyric speaker has also “learned to estimate”; in other words, she has learned how to draw on memory and imagination to create a nostalgic version of what she has lost. Bliss and the nostalgia for bliss, she now realizes, have a strangely symmetrical relationship: with the passage of time, the feeling of nostalgia itself begins to assume the exquisite purity that had once characterized the feeling of ecstasy. As the lyric speaker grows older still – as the value of $x$ grows larger and larger – what used to be one emotional extreme will turn into its reciprocal counterpart. This time, the curve will approach a horizontal asymptote: extending forward and endlessly into the future, her nostalgia will become a mirror image of the heights of ecstasy she felt long ago as a child.

Even more remote than childhood bliss and, therefore, even more valuable to Dickinson was the prospect of eternal life after death. Indeed, nothing was more inaccessible or more valuable to Dickinson than eternity. The second stanza of her poem “As by the dead we love to sit” offers a good example of how she used the imagery of asymptotes and curves to illustrate the limits to her knowledge of this infinitely elusive subject.

In broken mathematics
We estimate our prize
Vast - in it’s fading ratio,
To our penurious eyes!

(Fr78)

By the phrase “broken mathematics” Dickinson has in mind the “broken” or divided numbers (fractions) that express the ratios in such mathematical functions as $y = 1/x$. Like an ascending curve, the knowledge of eternity continually evades our limited comprehension. This longed-for “prize” is “fading” both because of its increasingly “Vast” distance from us and because our human ignorance – our figurative myopia, our “penurious” or poor vision – prevents us from seeing distant objects clearly. Yet despite our ignorance, we persist in striving to “estimate
our prize”; that is, we persist in striving to speculate about the afterlife. Our human speculation, according to Dickinson, is like an asymptote, a ghostly line that forever verges on the elusive and “fading” curve without ever making contact with it.

The following poem similarly uses the imagery of curves and asymptotes to account for the afterlife. Here, however, the asymptote corresponds to the afterlife and the curve corresponds to the limits of human knowledge.

The Road was lit with Moon and star -
The Trees were bright and still -
Descried I - by - the gaining Light
A traveller on a Hill -
To magic Perpendiculars
Ascending, though terrene -
Unknown his shimmering ultimate -
But he indorsed the sheen -

(Fr1474)

In the dreamlike vision presented here, the night sky is inscribed with two asymptotes – an $x$-axis and a $y$-axis – whose intersection forms an ethereal grid of “magic Perpendiculars.” From a distance, the lyric speaker watches as a “traveller on a Hill” – a figure for someone about to die – departs from the horizon of the earth and enters the mathematical space of the heavens. “Ascending” toward his final place in the divine scheme, the traveler creates a curve-like path that moves closer and closer to the vertical asymptote the higher and higher he ascends. The higher he ascends, moreover, the further he disappears from our human view. His “ultimate” destination is by definition “Unknown” to those of us who constitute the living. Still bound to the earth, we cannot yet apprehend where curve and asymptote – human journey and axis of immortality – will finally converge to become one. This is why the traveler’s “ultimate” destination has a “shimmering” quality: as something that we can only imagine, it hovers on the brink of abstraction in the mind. Significantly, the “shimmering” quality of the traveler’s destination calls to mind the “fading” quality of eternity in “As by the dead we love to sit.” Both words “shimmering” and “fading” conjure up the same image. Indeed, Dickinson might have described the “ratio” as “shimmering” and the “ultimate” destination as “fading.” The terminus of the traveler’s journey is synonymous with the “prize” that we “estimate” in the “broken mathematics” of ratios and asymptotes.
Not only does Dickinson fill her poetry with asymptotic images, but at times she associates the very form of the lyric with asymptotic limits that somehow manage to enclose an infinite entity without violating its untouchability. Consider, for instance, the following poem:

We shall find the Cube of the Rainbow -
Of that - there is no doubt -
But the Arc of a Lover’s conjecture
Eludes the finding out -

(Fr1517)

These lines use mathematical language to compare two different mysteries: the phenomenon of the rainbow and the thoughts inside a lover’s head. The first mystery, according to Dickinson, has a rather simple solution. By using the phrase “Cube of the Rainbow” – that is, by invoking the concept of a rainbow raised to the third power – she likens the rainbow to a finite number that is amenable to arithmetical manipulation. In other words, she suggests that the mystery of the rainbow can be solved as easily as, say, 2 times 2 times 2 can be calculated. (Indeed, Dickinson is probably alluding here to John Keats’ complaint that Isaac Newton managed to “unweave” the wonder of the rainbow by explaining it mathematically.) The second mystery, meanwhile, resembles not a finite number but a curve – the kind of curve that results from a mathematical function like \( y = \frac{1}{x} \). In Dickinson’s own words, the “Lover’s conjecture” is an infinite “Arc” whose total shape “Eludes the finding out.” But while she may not be able to solve this mystery arithmetically, she can approach it through a different mathematical procedure. Listen to the asymptotic way in which the form of the poem contains its elusive subject. Like an asymptote, the rhyme between “doubt” and “out” delicately inscribes the limits of what the poem signifies as knowable. Just as \( x^3 \) and \( x^n \) share the same base, “no doubt” and “eludes the finding out” share the same basic principle of sound, the same phonetic point of reference. The latter phrase may indicate the impossibility of securing knowledge of the lover’s elusive thoughts, but by referring back to “no doubt” it reminds us that the two moments in the poem exist on a single continuum. Moreover, by closing with an “out” that echoes the inner center of the poem (“no doubt”), the last line suggests that the infinite curve of the arc itself, no matter how far outward it veers, will never find a way out of the prismatic “Cube” whose form the poem’s shape imitates and externalizes.

A more elaborate Dickinsonian asymptote can be found in the following
poem, a fantasy about how it might feel to experience death.

The Admirations - and Contempts - of time -
Show justest - through an Open Tomb -
The Dying - as it were a Hight
Reorganizes Estimate
And what We saw not
We distinguish clear -
And mostly - see not
What We saw before -

'Tis Compound Vision -
Light - enabling Light -
The Finite - furnished
With the Infinite -
Convex - and Concave Witness -
Back - toward Time -
And forward -
Toward the God of Him -

(Fr830)

Notice, first of all, how the form of this poem behaves like a curve. Dickinson achieves this effect through slant rhymes that follow a scheme of continuous inflection. The scheme is carried out principally through the end rhymes: “time” turns to “Tomb,” “Hight” to “Estimate” to “not,” “clear” to “before,” “Light” to “Infinite,” and “Time” to “Him.” But the inflections of rhyme travel internally as well, particularly in the second stanza, where “Finite” modulates to “Infinite,” and “toward” is redirected to “forward.” Significantly, the vowel inflections here occur along fixed coefficients of transformation: the ratio of “Hight” to “Estimate” – that is, the ratio of the long vowel to the short vowel – roughly equals the ratio of “Light” (long vowel) to “Infinite” (short vowel); and the ratio of “time” to “Tomb” – that is, the ratio of the front vowel to the back vowel – roughly equals the ratio of “clear” (front vowel) to “before” (back vowel). Tracking the rhyme scheme from each rhyme to its slant rhyme, from long vowel to short vowel, from front vowel to back vowel, we can hear the sound of the poem accelerating along a mathematical curve.

If the form of this poem behaves like a curve, then the poem’s subject matter – a fantasy about the experience of death – behaves like an asymptote: untouch-
able, inaccessible, it exists in a state of ghostly ideality. Just as the curve cannot become one with its asymptotic limit, the form of the poem cannot become one with its elusive subject matter. But this does not prevent Dickinson from describing the fantasy itself in terms of the impossible. In her dream of death, all things do in fact become one. The distinction between “Admirations” and “Contempts” falls apart. A “Finite” life is “furnished” with the “Infinite” nature of God. And a mathematical curve finally makes contact with its asymptote, thereby uniting the “Concave” and the “Convex” into a straight line that moves both “Back - toward Time - / And forward.” What Dickinson described in “The Road was lit with Moon and star” as a “shimmering ultimate” is here no longer a distant mirage but rather an immediate reality. At long last, the self “Reorganizes Estimate”: mortal speculation has been rendered obsolete by the knowledge of perfect harmony.

Even in poems where Dickinson’s use of mathematics is “broken” or more evocative than logical, there is a precision in how she “breaks” her mathematics. In the following poem, for example, she carefully synthesizes arithmetical logic with grammatical principles.

I could suffice for Him, I knew -
He - could suffice for Me -
Yet Hesitating Fractions - Both
Surveyed Infinity -

“Would I be Whole” He sudden broached -
My Syllable rebelled -
’Twas face to face with Nature - forced -
’Twas face to face with God -

Withdrew the Sun - to other Wests -
Withdrew the furthest Star
Before Decision - stooped to speech -
And then - be audibler

The Answer of the Sea unto
The Motion of the Moon -
Herself adjust Her Tides - unto -
Could I - do else - with Mine?

(Fr712)
These stanzas invoke mathematics not only by alluding to “Fractions” and “Infinity” but also by raising the specter of mathematical equality. Several words and phrases – “suffice,” “‘Twas face to face,” “Withdrew” – appear in duplicate form, reminding us of the reflexive axiom “a = a.” And insofar as to suffice for something is to be equal to it, the first two lines set up the following equations:

I = Him
He = Me

These equations are complicated, however, by the fact that the “Fractions” represented by “I” and “He” are described as “hesitating” to make themselves equal to each other. Furthermore, the equation of the “I” with the “He” is consistently verbed in the subjunctive: I could equal him, and he could equal me. In mathematics, fractions are rational numbers. But the fractions in this poem behave irrationally. They seem to have dream-lives: as the hypothetical nature of their equation implies, they have fantasized about this equation taking place. Moreover, these dreaming fractions are unstable creatures – nervous, ambivalent, and unable to control their actions. When the lyric speaker is asked a “sudden” question by the other fraction, she immediately “rebels” against the gesture, despite the fact that she secretly identifies with him. Not only do these tentative fractions fail to connect with each other, but they can never hope to become unfractional or “Whole.” Something prevents them from amounting to the oneness – the completeness, the unity – of an integer. Their fractional nature is accentuated by the backdrop against which they exist: the desolate abyss of infinity. This is especially true of the “I,” whose feeling of incompleteness intensifies after the “He” mysteriously disappears in the second half of the poem. By bringing grammatical and mathematical frameworks into a single space, Dickinson creates what we might call the “pronoun-fraction” – a unit of poetic expression corresponding to the loneliness experienced by the disconnected self.

“A Clock stopped” is another poem in which Dickinson carefully integrates mathematical language with non-mathematical language. Here, more specifically, she designs an alphanumerical cipher for the ineffable subject of death.

A Clock stopped -
Not the Mantel’s -
Geneva’s farthest skill
Can’t put the puppet bowing -
That just now dangled still -
In this poem, a man on his deathbed is suddenly no longer alive. Cold as a “Pendulum of snow,” his body “will not stir for Doctor’s” anymore. Looking at the corpse, the lyric speaker is reminded of a “puppet” whose limbs have ceased “bowing” and have “just now dangled still.” But she is reminded even more powerfully of a broken measuring device, something along the lines of a “stopped” chronometer. Under normal circumstances, we are told, the device would show the results of its calculations in terms of “Decimals,” that is, fractions whose denominators equal some power of ten – 1/10, 1/100, 1/1000, and so on. But the circumstances here are far from normal. Whatever was being measured here before (the dead person’s age? his wisdom? the number of memories he had accumulated so far?) is now “Degreeless,” beyond measure: it has “quivered out of Decimals” and passed into a state that mathematics alone cannot evaluate. As a result, the gauge no longer displays intelligible numbers. Instead, it displays the strikingly cryptic message “noon.”

How we construe this message is influenced in part by other instances in which Dickinson uses the word “noon.” As Sharon Cameron has noted, many of Dickinson’s poems invoke this word to signify “the deathless world of no time” (260), “the clockless escape from time that would liberate into the longed-for permanence” (2). “A Clock stopped” is certainly no exception: the corpse/gauge reads “noon” because it is unequipped to measure the timelessness where the dead person now resides. But “noon” does more than simply stand for immortality here.
It is also mimetic of the fact that immortality is opaque, inaccessible, to those of us who have yet to die. To put it otherwise, “noon” is a cipher that mimetically represents the cipher – the zero-ness, the blankness – that constitutes death itself. We recognize this mimesis on both a verbal level and a mathematical level. On the verbal level, we hear the way “noon” echoes the hollow “oh/oooh” sounds that evoke the unresponsiveness of the dead person in the poem’s thirteenth line: “cool - concernless No.” We notice, too, how “noon” resembles words like “none” and “no one” – words that conjure up the absence of the no-longer-living. And we perceive that “noon” is what Cynthia Griffin Wolff has identified as a palindrome containing “the word ‘no’ placed ‘face-to-face’” (192). On the mathematical level, meanwhile, we see a doubling of the numerical sign for nothingness. As Wolff has noted, the word “noon” contains “zero at the center – twice zero, in fact, which as Lear’s Fool has informed us, is still zero” (192). These double zeroes visually remind us of the symbol for degreelessness, the temperature of death: “0˚.” But they also remind us of the zeroes in a decimal fraction like 1/100 or 0.01. By doing so, they suggest that “n00n” is itself a decimal expression, perhaps of a number like 1/0. (Does one divided by zero, then, equal immortality?) In short, “A Clock stopped” synchronizes the image of zeros implied by the word “decimals” (1/100, 1/1000) with the myriad meanings of the typographical symbol “O” (the number zero, the alphabet letter “O,” the vowel syllable “oh,” and the degree symbol “˚”) in order to further encrypt the already cryptic subject of death.

The measuring device in “A Clock stopped” offers a model for thinking about Dickinson’s poetry. Like the corpse-gauge, Dickinson’s body of work is a reflection of the ineffable. Unlike the measuring device, however, her poems have the power to illuminate the ineffable through mathematics. Not only did the precision of mathematical language make it possible for Dickinson to formalize how she thought and felt about elusive matters, but the imagery of mathematics made it possible for Dickinson to render such elusive matters available to the imagination. In particular, the diaphanousness of mathematical diagrams informed what Archibald MacLeish and David Porter have characterized as the “strangely abstracted” quality of Dickinson’s poetic imagery. A speck upon a ball, the circular path of a butterfly, the arc of a lover’s conjecture, a fading ratio, the diameters of eternity, a hesitating fraction, the plumpness of a binomial theorem: such images lack sensuous immediacy. They belong to the translucent realm of trapezoids, rhombuses, parabolas, and octagons. Instead of registering on the sensorium, they take their place somewhere in between the cognitive and the sensorial. When we
encounter Dickinson’s most strangely abstracted images, we find ourselves exercising what Plato describes in *The Republic* as “a certain organ in every student’s soul” that is “cleansed and rekindled” by the study of mathematics when it has been “blinded and destroyed” by other pursuits, an organ that is “more worth saving than a thousand eyes, for by this organ alone is the truth perceived” (179). As Plato asserts here, and as Dickinson also believed, to know mathematics is to come very close to transcending bodily experience and realizing the ineffable nature of eternity. Through the strangely abstracted language and disembodied imagery of mathematics, Dickinson’s poetry speaks to us from beyond the world of time.

**Notes**

1. According to Cynthia Griffin Wolff, Dickinson “was given more instruction in current mathematics and science than the average American schoolboy is given now” – “now” meaning in 1986 (342-343, italics in the original).
2. In addition, for Dickinson’s interest in science, see chapter two of *Emily Dickinson’s Vision* by James R. Guthrie, “Emily Dickinson: Learnd Astronomer” by Brad Ricca, and “Chemical Conviction: Dickinson, Hitchcock, and the Poetry of Science” by Hiroko Uno.
3. Keats makes this complaint in his 1820 poem *Lamia*. For a rich account of how mathematical and scientific explanation can actually enhance the rainbow’s mystery, see Philip Fisher’s *Wonder, The Rainbow, and the Aesthetics of Rare Experiences*.
4. For an insightful study on Dickinson and rhyme, see Judy Jo Small’s *Positive as Sound: Emily Dickinson’s Rhyme*.
5. “Degreeless noon” can also be interpreted as a way of visualizing a timepiece that reads “twelve o’clock.” As Wolff points out, “Noon is a ‘Degreeless’ hour because when both minute and hour hand point to twelve, they are superimposed: there is no angle between them; they are separated by zero degrees” (192).

**Works Cited**

The following abbreviations are used to refer to the writings of Emily Dickinson:


