Meanderings: 3/18/22

The foundation of human mathematics is geometry. If one would take some time to look at the written works (they happen to be library available) of Newton, Kepler, and the time-tested Conic Treatise of Apollonius, you will be face to face with the stick art of human mathematics. However, unlike art, freedom of interpretation is <u>not</u> invited. Only a single path of rigorous logic leading to an irrefutable conclusion is proffered. Proofing still rules today, as the only way to structure an argument advancing human math to the next level.

For me, it is not important to understand the proofing used by the Masters in their exploratory Philosophical Geometry, for this can be as difficult to fathom as a triple integral proof. Simply witness the incisive descriptive language explaining methods used by these great geometers of our past, Huygens, Newton, and Kepler, to name a few, as they ponder Questions of Natural Phenomena of Being using descriptive mathematical relations between lines and curves with the unique irrefutable perspective of picture-perfect classic geometry.

ALΣXANDΣR; CEO SAND BOX GEOMETRY LLC

The science of curved space parametrics (2).

Constructing inversed exponent (roots) of Cartesian domain integers part1.

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If we want to learn how to construct curved space mechanical energy of central force fields, it is necessary to learn the shaping phenomena of exponents in square space and inversed exponents of curved space.

The science of curved space parametrics. A STEM accelerator	November 28 2021

A curved space parametric tool for constructing inverse exponent operation(s) on Cartesian number line counting integers.

A presentation of exponents and roots. Changing the shape of space curves.

Began: Sunday, November 28, 2021.01:13.

~~Completed~~ Thursday, February 17, 2022. 05:47.

Completed Friday, March 11, 2022. 02:35. 21 pages; 3100 words.

Part1 of inverse exponents: April 4, 2022; 01:05.
12 pages; 1700 words.

On written symbols and digital code for roots and exponents.

Exponents are a straightforward operation $(number^{exponent})$. Roots have an alternate script and symbol. Given we know the $(3^3 = 27)$. We also recognize $\left(\sqrt[3]{27} = 3\right)$. But not so often used is the written exponent for $\left(\sqrt[3]{27}\right)$; $\left(27^{\frac{1}{3}} = 3\right)$. Note the inverse of exponent (3) in the examples is cube root or $\left(\frac{1}{3}\right)$. Using inverse exponents eliminates the radical.

There are three elements in the parametric geometry of roots: index; radical; and radicand. $\sqrt[index]{radicand}$.

We never include the index when writing square roots. Why? Don't know! Anyway, the unused term for square root of 4 is: $\left(\sqrt[2]{4} = 2\right)$. *<u>Or</u>* $\left(4^{\frac{1}{2}}\right)$.

We also have seldom seen exponents.

$$(n^0 = 1);\ (n^1 = n)$$

Setting these exponents $(0\ and\ 1)$ at radical index:

$\left(\sqrt[1]{n}\right) = n,$ and $\left(\sqrt[0]{n}\right) = \left(\frac{1}{0}\right.$ indeterminate infinity encountered).

When I was in school, we simply forbade thinking a (0) denominator. Now we claim (indeterminate infinity)?? Curved space parametric geometry *will* provide a construction of $\left(\sqrt[0]{n}\right)$. A parametric curved space system having range without domain. A strange beast, but one hell of an interesting range intercept with the dependent curve composing analytical registration of the counting integer playing the part of $(radicand)$ to be interviewed:

$$\left(\sqrt[0]{radicand}\right).$$

When constructing parametric solution curves finding integer roots, I reference the <u>index</u> and <u>radicand</u> as the main components composing parametric solution curves.

USING A (CSDA©) TO CONSTRUCT ROOTS OF MAGNITUDE:

DEFINITION: a **CSDA** is my parametric machine I use to analyze Central Force Mechanical Energy.

PROBLEM1: Construct the $\sqrt[2]{\mathbf{2}}$:
I use a Euclidean perpendicular divisor to find exact and precise median of magnitude. The median will provide the radius of the unit circle with which to build the unit parabola. As in calculus, I use methods that "flex" a curve by changing the dependent curve *exponent*. In so doing I create a solution curve to intercept the Latus Rectum number line at the desired radicand index I seek.

PowerPoint Informative (parametric upgrade for EUCLID'S ⊥ divisor). 2013 MATHFEST, HARTFORD CONNECTICUT

All my roots of magnitude constructions begin with Euclid's perpendicular divisor.

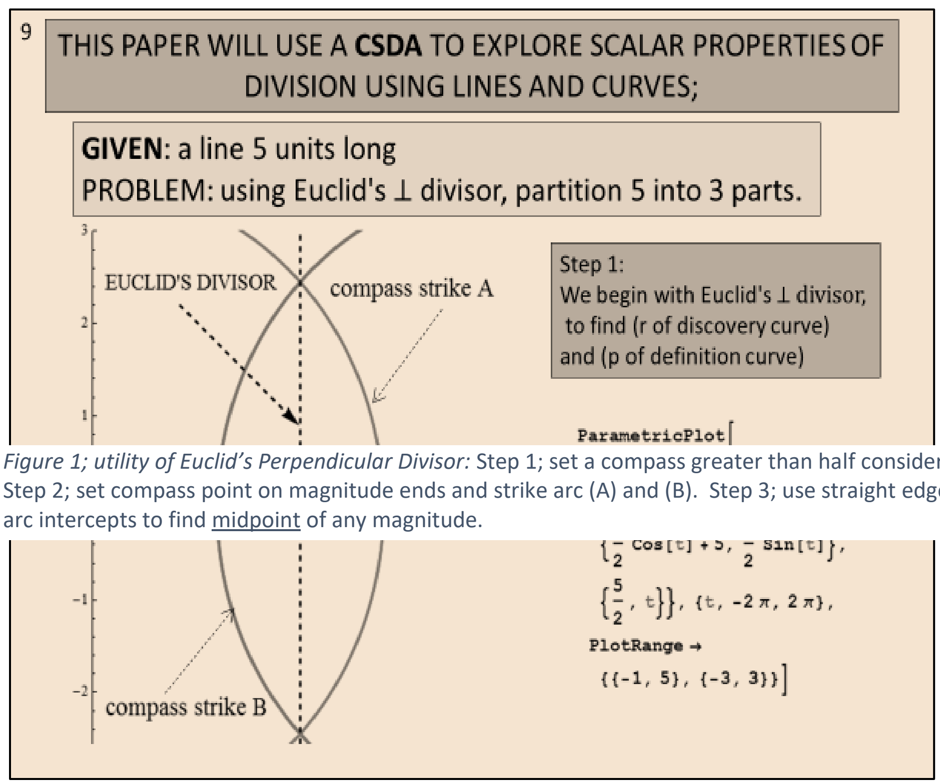


Figure 1; utility of Euclid's Perpendicular Divisor: Step 1; set a compass greater than half considered magnitude. Step 2; set compass point on magnitude ends and strike arc (A) and (B). Step 3; use straight edge connection of arc intercepts to find midpoint of any magnitude.

I've changed the moniker of independent curve to discovery and dependent curve to definition.

We can now use computer based parametric geometry to construct $(\sqrt{2})$. After which I will post methods to construct roots of any magnitude.

1st, I post the desired root on our number line with a computer-based (root) abscissa ID; then construct curved space parametric intercept(s), confirming agreement between square space abscissa index ID and curved space root solution curves.

Sand Box Geometry construction $(\sqrt[2]{2})$ or $\left(2^{\frac{1}{2}}\right)$.

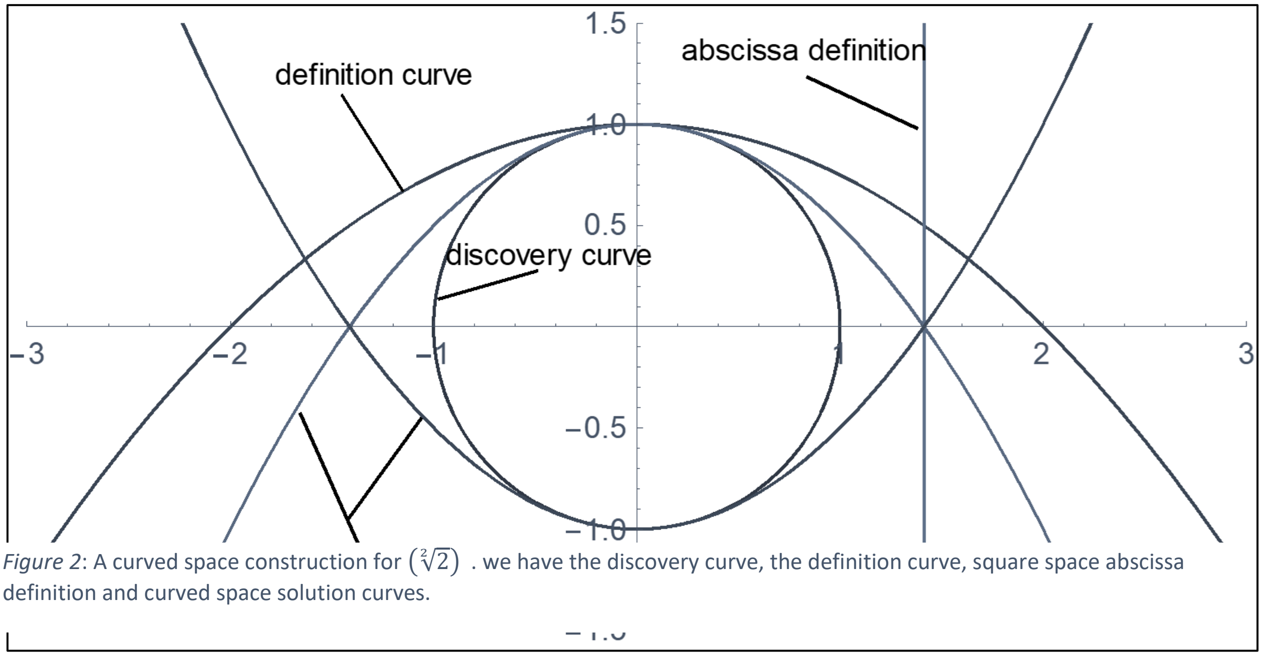


Figure 2: A curved space construction for $(\sqrt[2]{2})$. we have the discovery curve, the definition curve, square space abscissa definition and curved space solution curves.

I call the unit circle and unit parabola a unit moniker because the curves are constructed using a pre-determined unit of square space: (Euclid's magnitude/2). Half to discovery and half to definition.

These are the methods to construct roots of magnitude.

- Divide the considered magnitude in half to find the discovery radius. With the discovery radius construct a dependent parabola definition curve to register magnitude (radicand/integer) location on Cartesian square space number line with the **CSDA** parametric machine.

- Independent (DISCOVERY) curve parametric description: $\left(\frac{magnitude}{2} Cos\ [t], \frac{magnitude}{2}\ Sin[t]\right)$.
- Dependent (DEFINITION) curve parametric description: $\left(t, \frac{t^2}{-4(p)} + r\right)$, where ($p$) = ($r$: $\frac{magnitude}{2}$) of discovery curve.
- Solution curves for roots of magnitude:

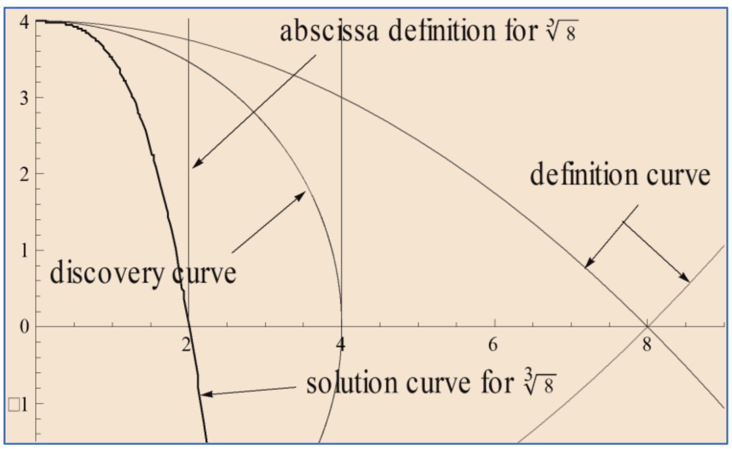
$$\{t, \left(t^{index}/\mp 2\right) \pm (radicand/2)\}$$

Parametric geometry means to construct $(\sqrt[3]{8})$. A CSDA UTILITY

Sand Box Geometry Demonstration on roots of magnitude; construct$(\sqrt[3]{\mathbf{8}})$.

$$\text{ParametricPlot}[\{\{\frac{8}{2}\text{Cos}[t],\frac{8}{2}\text{Sin}[t]\},\{t,\frac{t^2}{-4\left(\frac{8}{2}\right)}+\frac{8}{2}\},\{t,\frac{t^2}{+4\left(\frac{8}{2}\right)}-\frac{8}{2}\},$$

$$\{t,\frac{t^3}{-2}+\frac{8}{2}\},\{\sqrt[3]{8},t\},\{4,t\}\},\{t,0,6\pi\},\text{PlotRange}\to\{\{0,9\},\{\frac{-3}{2},4\}\},$$



Proof that the solution curves are at$(\sqrt[3]{8})$.

We see $\{t\to 2\}$is one of the roots.

$$\text{Solve}\left[\frac{t^3}{-2}+\frac{8}{2}==\frac{t^3}{+2}-\frac{8}{2},t\right]\xrightarrow{yields}$$

$$\{\{t\to 2\},\{t\to -2(-1)^{1/3}\},$$

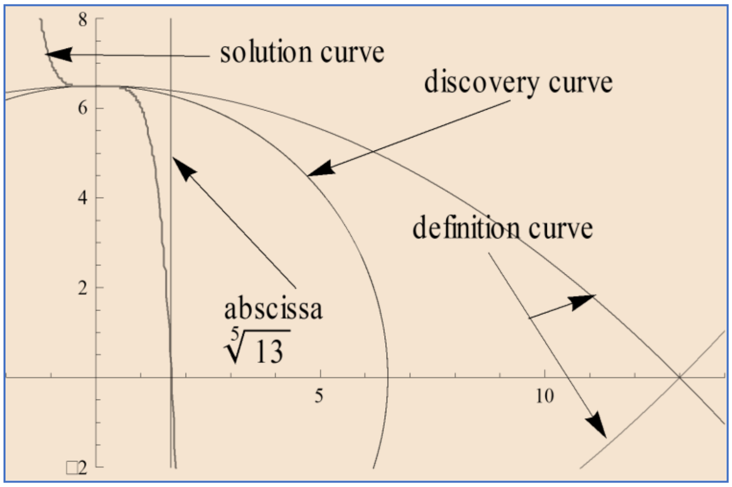
$$\{t\to 2(-1)^{2/3}\}\}$$

I reject other root solutions as I am only interested in 1st quad positive intercept of Cartesian number domain.

My last demonstration will be to construct: $(\sqrt[5]{13})$.

The parametric description will be:

$$\text{ParametricPlot}[\{\{\frac{13}{2}\text{Cos}[t],\frac{13}{2}\text{Sin}[t]\},\{t,\frac{t^2}{-4\left(\frac{13}{2}\right)}+\frac{13}{2}\},\{t,\frac{t^2}{4\left(\frac{13}{2}\right)}-\frac{13}{2}\},\left\{t,\frac{t^5}{-2}+\frac{13}{2}\right\},\{\sqrt[5]{13},t\}\},\{t,-2,6\pi\},\text{PlotRange}\rightarrow\{\{-2,14\},\{-2,8\}\}]$$



The Curved Space Division Assembly (**CSDA**)construction for the $(\sqrt[5]{13})$; <u>negative</u> solution curve only.

Proof that the solution curves are at the fifth root of 13.

$$\text{Solve}[\frac{t^5}{-2}+\frac{13}{2}==\frac{t^5}{+2}-\frac{13}{2},t]\xrightarrow{yields}\{\{t\rightarrow-(-13)^{1/5}\},\{t\rightarrow 13^{1/5}\},\{t\rightarrow(-1)^{2/5}13^{1/5}\},\{t\rightarrow-(-1)^{3/5}13^{1/5}\},\{t\rightarrow(-1)^{4/5}13^{1/5}\}\}$$

Gauss' Fundamental Theorem of Algebra determines number of solution terms a polynomial has by highest degree exponent. $\{\sqrt[5]{13},t\}$ has (5) inversed exponents:

$\left(let\ \left(13^{\frac{1}{5}}\right)=n\right)$ then $(n^5)=13$. Solution for $(index\ of\ n)$ requires (5) equal multipliers to arrive at integer (13). Gauss zeros a polynomial for solution term(s). Curved space zeros slope of solution curves to fall precisely on root(index) of a **CSDA** domain integer.

Curved space construction of $(\sqrt[4]{2})$; to see the changing shape of even indices solution curves.

We see that even indices $(curves\ c\&d)$ solution curves are parabolic shaped.

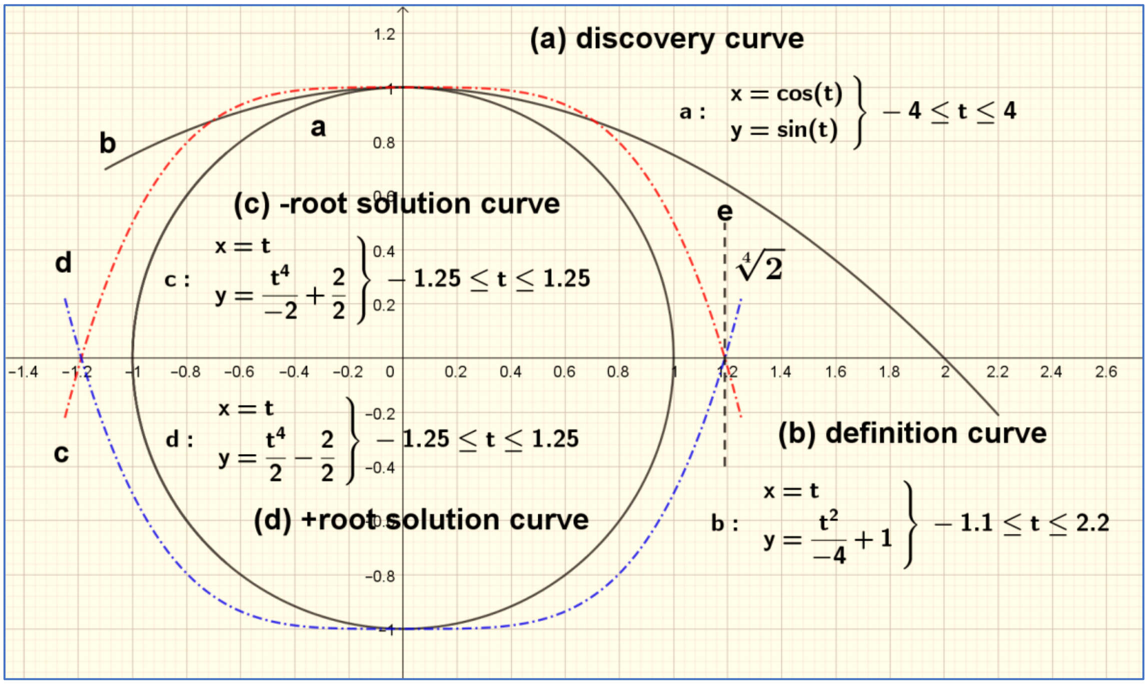


Figure 3: Curved Space Construction for $\sqrt[4]{2}$. (e) is abscissa definition for $(\sqrt[4]{2})$.

I use **CSDA** constructions to study mechanical energy curve(s) of two Central Force Fields. A spinning Central Force Field requires balanced energy symmetry to exist. Polarity $(N\&S)$, charge $(+\&-)$, rotation definition being $(W\&E)$, and. Spin/rotation are always **CSDA** present. Fold any **CSDA** construction on spin axis and **E** meets **W** with perfect (energy curve) alignment. Fold any **CSDA** along rotation plane and we have two views. **S** to **N** and **N** to **S**. Solution curves may look congruent when folded along rotation, however, both views carry different polarity and sign. **S** with no negative $(slope)$ solution and **N** without a positive.

In figure(3) I have only the $(-half)$ of the **CSDA** $\left(\frac{\pi}{2}\text{ spin vertex}\right)$ of definition curve (b).

I sign parametric curves according to slope of intercept by the curve with the rotation domain of the field, red for negative and blue for positive.

Curved space construction of $(\sqrt[5]{3})$; to see the changing shape of odd indices solution curves.

$$\text{ParametricPlot}[\{\{\frac{3}{2}\text{Cos}[t], \frac{3}{2}\text{Sin}[t]\}, \{t, \frac{t^2}{-4\left(\frac{3}{2}\right)} + \frac{3}{2}\}, \{t, \frac{t^5}{-2} + \frac{3}{2}\}, \{t, \frac{t^5}{+2} - \frac{3}{2}\}, \{\sqrt[5]{3}, t\}\}, \{t, -3\pi, 3\pi\}, \text{PlotRange}{-}{>}\ \{\{\frac{-7}{2}, 6\}, \{-5/2, 5/2\}\}, \text{AxesOrigin}{-}{>}\ \{0,0\}]$$

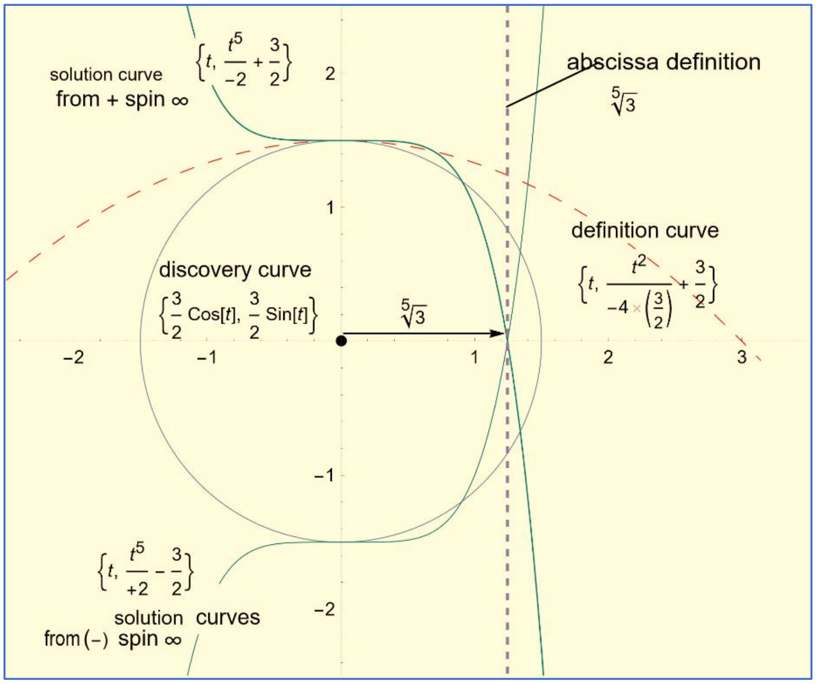


Figure 4: **CSDA** construction defining shape of odd indices.

Note: solution curves always pass through independent $\left(\frac{\pi}{2};\ 90°; N\right)$ & $\left(\frac{3\pi}{2}; 270°; S\right)$ with flatline (zero slope). Square space math zero's a polynomial to find roots, curved space zeroes slope. The spin angles of a **CSDA** spherical profile are vertices $(N\&S)$. **N** is (π/2), and **S** is $\left(\frac{3\pi}{2}\right)$.

Rotation diameter end points also have definition. Rotation plane of a **CSDA** is the dependent parabola Latus Rectum chord defining (Gfield) average diameter end points $(E\ \&\ W)$. **W** is $(\pi;\ 180°)$ and **E** is $(0°or\ 2\pi;\ 360°)$.

These four radian angles are the only radian description used by the Sandbox.

<u>*Spin*</u>: **N**: (π/2 = 90°); **S**: $\left(\frac{3\pi}{2} = 270°\right)$. <u>*Rotation*</u>: **W**: (π = 180°); **E**: (0°or 2π; 360°).

I'm preparing an in depth, very in-depth paper on inverse exponents of curved space. I ask $10 as sustaining contribution for the SandBox paper. No where will you find a more intriguing textbook on **CSDA** utility to explore curved space for the price! ALΣXANDΣR; CEO SAND BOX GEOMETRY LLC

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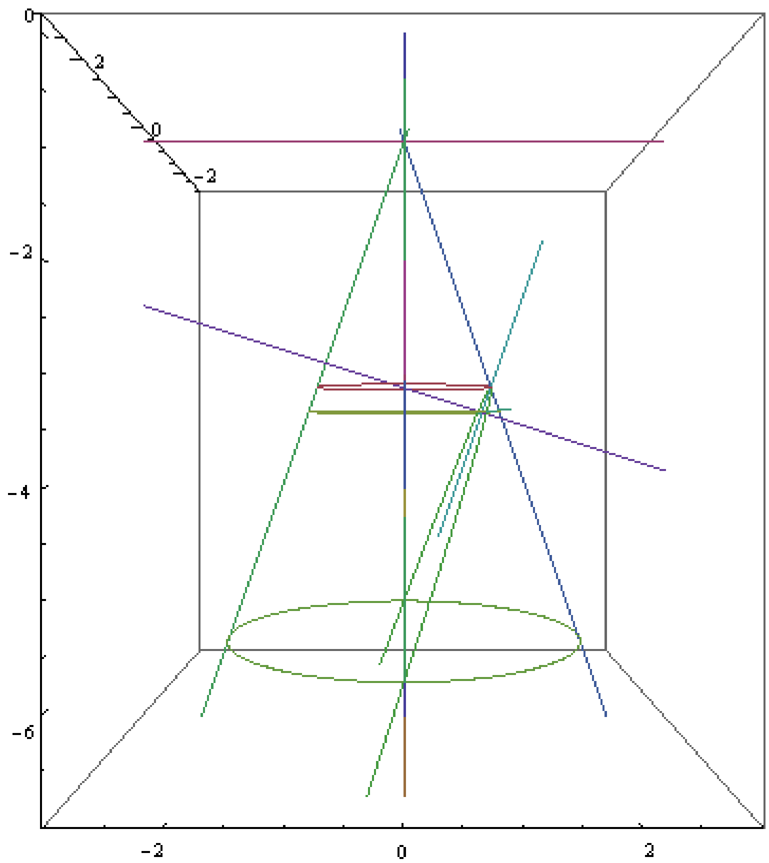
Sand Box Geometry LLC, a company dedicated to utility of Ancient Greek Geometry in pursuing exploration and discovery of Central Force Field Curves.

Using computer parametric geometry code to construct the focus of an Apollonian parabola section within a right cone.



"It is remarkable that the directrix does not appear at all in Apollonius great treatise on conics. The focal properties of the central conics are given by Apollonius, but the foci are obtained in a different way, without any reference to the directrix; the focus of the parabola does not appear at all... Sir Thomas Heath: "A HISTORY OF GREEK MATHEMATICS" page 119, book II.

The computer is my sandbox, the unit circle my compass, and the focal radius of the unit parabola my straight edge.

ALΣXANDΣR; CEO SAND BOX GEOMETRY LLC

CAGE FREE THINKIN' FROM THE SAND BOX

The square space hypotenuse of Pythagoras is the secant connecting (π/2) spin radius (0, 1) with accretion point (2, 0). I will use the curved space hypotenuse, also connecting spin radius (π/2) with accretion point (2, 0), to analyze g-field energy curves when we explore changing acceleration phenomena of Gravity.

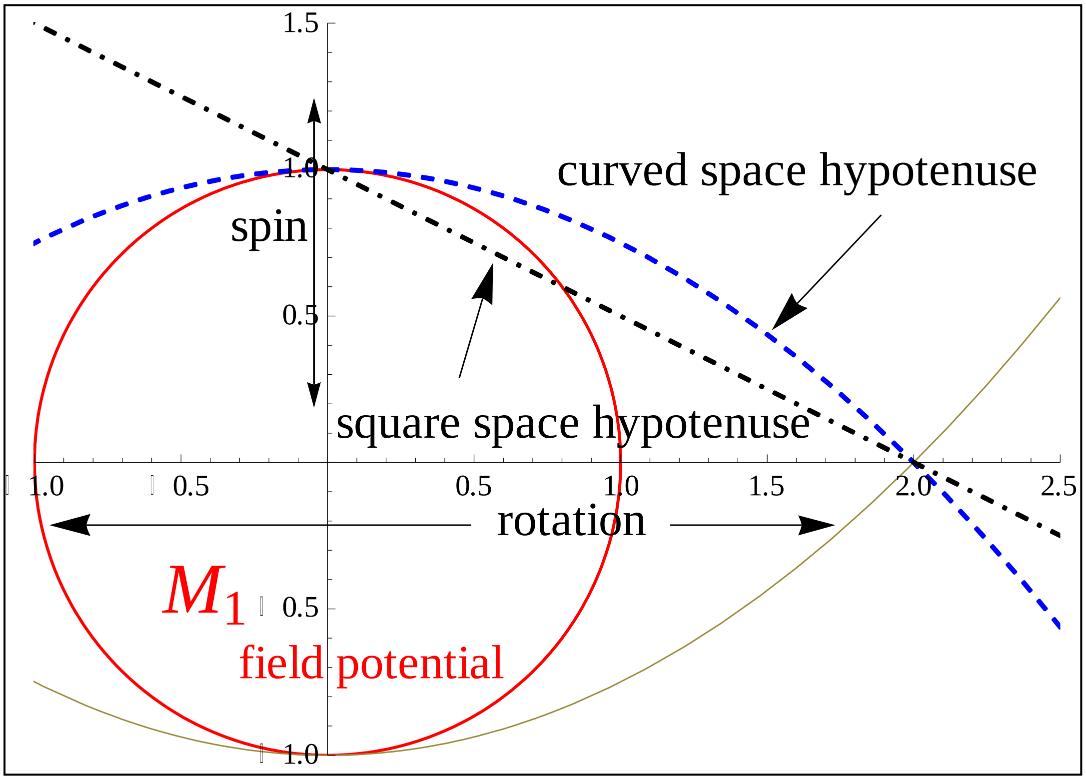


Figure 5: CSDA demonstration of a curved space hypotenuse and a square space hypotenuse together.

We have two curved space hypotenuses because the gravity field is a symmetrical central force and will have an energy curve at the **N** pole and one at the **S** pole of spin: just as a bar magnet. When exploring changing acceleration energy curves of M_2 orbits, we will use the N curve as our planet group approaches high energy perihelion on the north time/energy curve.

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