An elementary study of the roots and exponents; and a Computer Based Math mechanical contrivance to construct rotation roots on a spinning central force field.

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

Constructing Roots on a Central Force Magnitude

April 7
2019

Gauss's fundamental theorem of algebra, simply stated, declares that a polynomial when zeroed out, will have a number of solutions determined by highest degree exponent. I construct a parametric geometry abscissa definition for 1st Quadrant root(s) of a specific central force magnitude. Then I provide two curved space solution curves to intercept abscissa definition of roots. The first place I need visit, as a starting comparative of square space math, curved space math, discovery and Computer Based construction of roots of a Central Force Magnitude has to be exponents and how they shape the space curves we live with.

Curves and lines of numbers and their exponents

Index

Monograph 34 pages, 4800 words with *Mathematica.*

INTENTIONS

I have been working with methods to construct G-field mechanical energy curves for 25 years.

I feel the only way to, analyze, construct, and see changing mechanical energy of the G-field is with Computer Based Geometry. Specifically, computer based parametric geometry using curves.

What better way to study curved space then with curves?

I invented a Curved Space Division Assembly so I could use curves to study curved space mechanical phenomena.

I found methods, using the same computer mechanical tool, to construct roots.

Constructing roots using curves is enlightening. I use the index (a) as a parametric exponent to construct solution curves for designated root of (b). $\left(\sqrt[a]{b}\right)$.

There will be two solution curves for (a^{th}) root radicand (b). $\left\{t, \frac{t^a}{\mp 2} \pm \frac{b}{2}\right\}$.

A CSDA is a central relative machine. Being so, I can study the two infinities of our being. Parametric Central Relativity view of the Creation is a two-way street. On one end of this linear vision into space of our being is curvature. The other end is radius of curvature. Micro space infinity, the realm of curvature, and macro space infinity for radius, is the sight line connecting Creation with the human mind.

It is not a far step to change a Cartesian Coordinate System into a spinning platform, to work space curves with square space math. We do so with a little ancient Greek Geometry, and math essence of the past 500 years, and 21^{st} century computer technology.

CURVED SPACE DIVISION ASSEMBLY (**CSDA©**)

What better way to study curved space then with curves?

There are only two curves in Plane Geometry that have loci obedient to one center that I know of.

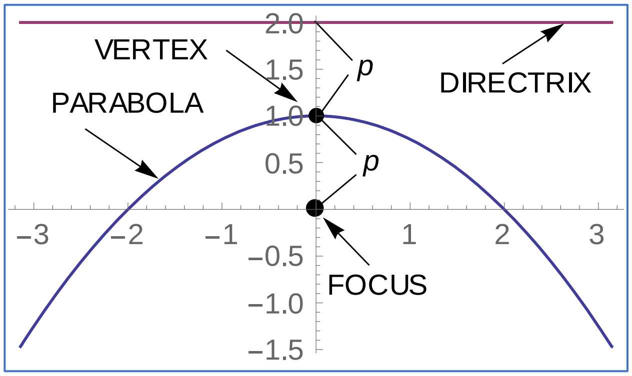


Figure 1: the unit parabola

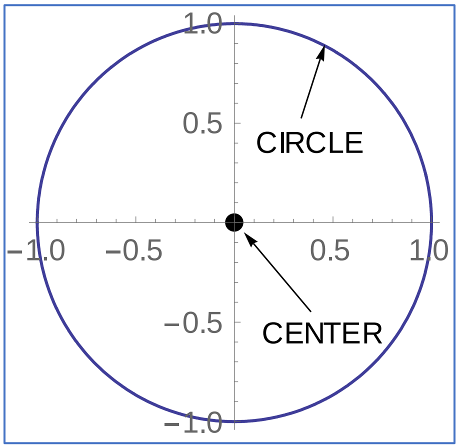


Figure 2: the unit circle

- The Circle. We already know a circle and its center.
- The Parabola and its focus. This curves locus has obedience split between a directrix and its focus.

What is interesting about a parabola curve is how a center point becomes a focus. A unit Parabola focal radius is not constant as a circles radius is, but changes meter as it traces the locus of the curve. What is constant in a parabola, is the properties exhibited between the focus, vertex, and directrix. I use the number (*p*) to demonstrate this fact. The line from the focus to the curve's vertex is the *initial* focal radius and is 1 unit in length, therefore (*p* = 1) in the Unit Parabola Construction (only) The magnitude of dependent curve, initial (*p*), grows with the size of the independent curve circle.

Significant parts of a parabola are:

- initial focal radius (*p*, focus to vertex) and
- Latus Rectum Diameter (4*p*).

Important! $(r = p)$; always. When studying 3-dimensional space, this adage becomes $\left(initial\ focal\ r = \frac{\pi}{2} spin\ r\right)$.

Geography of a **Curved Space Division Assembly (CSDA)**

$$\mathrm{ParametricPlot}[\{\{\mathrm{Cos}[t],\mathrm{Sin}[t]\},\{t,\frac{t^2}{-4(1)}+1\}\},\{t,-\pi,\pi\},$$
$$\mathrm{PlotRange}\to\{\{-3,3\},\{\frac{-3}{2},\frac{3}{2}\}\}]$$

This construction is a basic parametric geometry **CSDA.** It is the standard model I use to determine roots of linear magnitudes. A **CSDA** spins. A freeze frame of **CSDA** spin is always congruent with any other freeze frame spin selection.

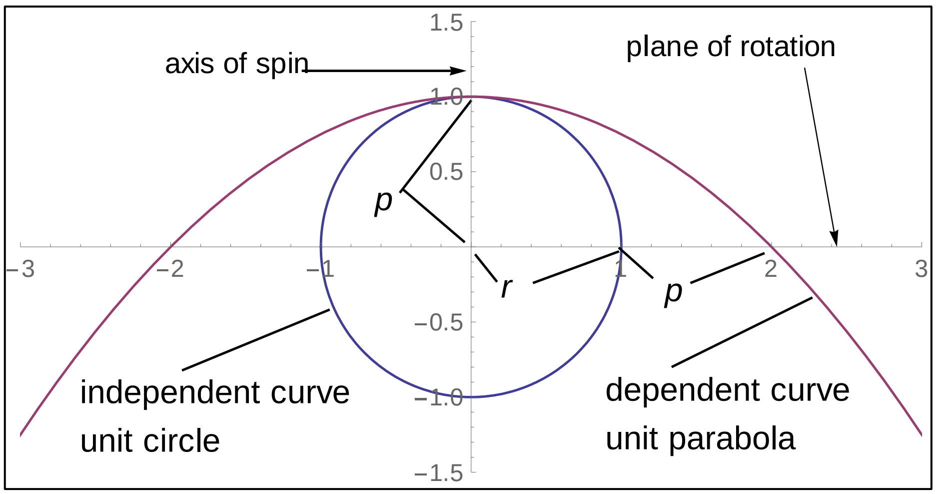


Figure 3: basic CSDA. Most important proportion is (π/2) spin radius (r) and initial focal radius (p); (r = p)

CSDA curved space geometry uses calculus function hierarchy to establish a parametric geometry function, allowing the **CSDA** system utility of two parametric curves. The discovery curve will be the independent curve, definition curve is dependent.

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

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

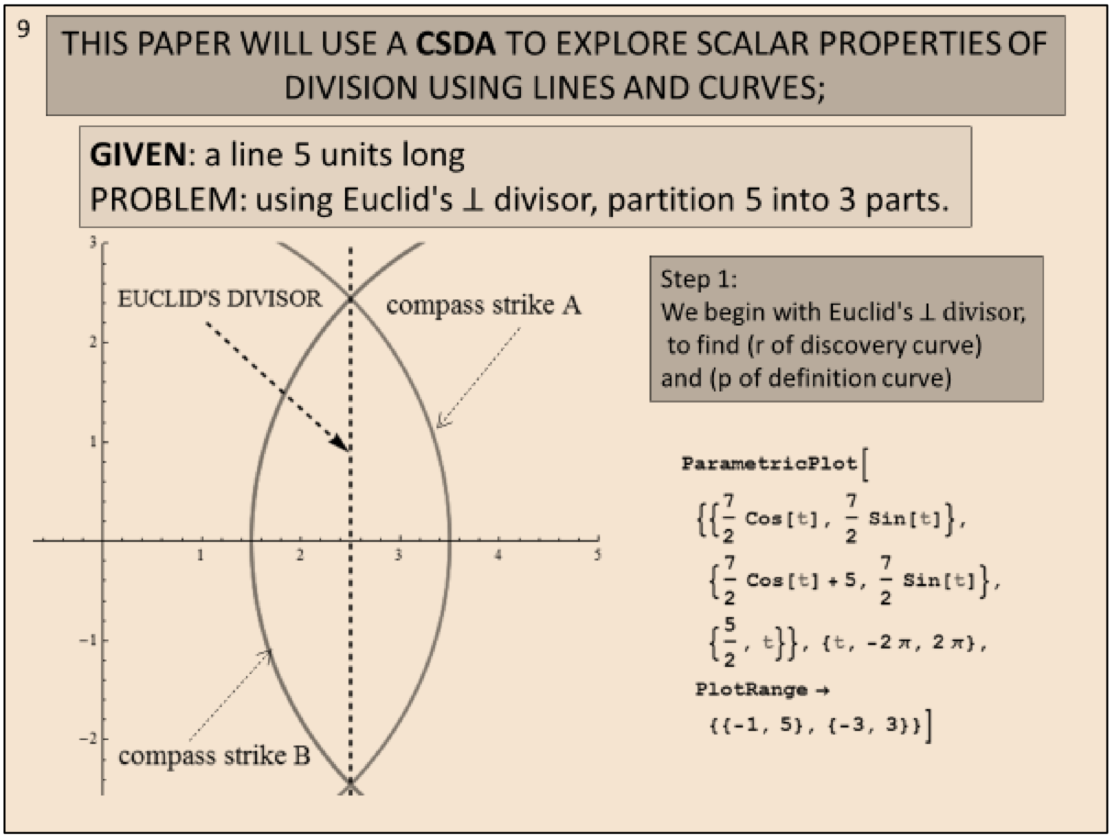


Figure 4; utility of Euclid's Perpendicular Divisor: Step 1; set a compass greater than half considered magnitude. Step 2; set compass point on magnitude ends and strike arc (A) and (B). Step 3; use straight edge connection of arc intercepts to find midpoint of any magnitude.

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

I use basic computer technology to find and mark the place in/on the space defined by our linear number line with a root abscissa ID; then construct curved space intercept, confirming agreement between square space math and curved space math between root solution curves and abscissa ID.

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

$$\text{ParametricPlot}[\{\{\text{Cos}[t],\text{Sin}[t]\},\{t,\frac{t^2}{-4(1)}+1\},\{\sqrt{2},t\},\{t,\frac{t^2}{-2}+\frac{2}{2}\},\{t,\frac{t^2}{+2}-\frac{2}{2}\}\},\{t,-\pi,\pi\},\text{PlotRange}\to\{\{-3,3\},\{\frac{-3}{2},\frac{3}{2}\}\}]$$

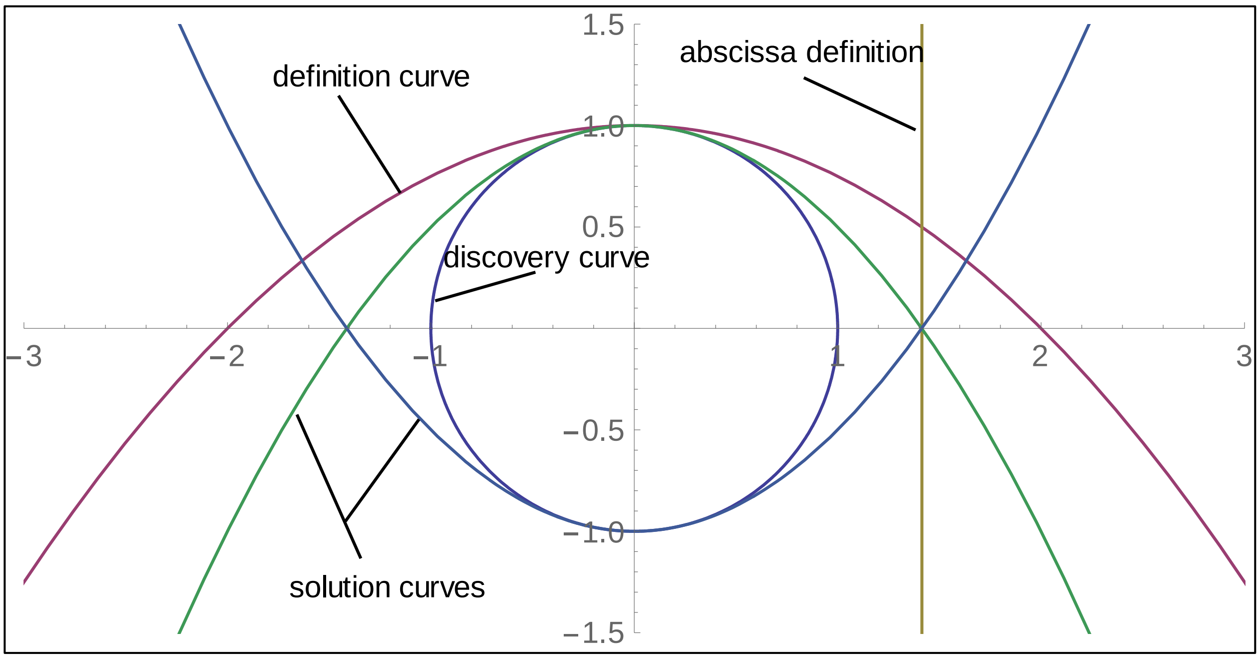
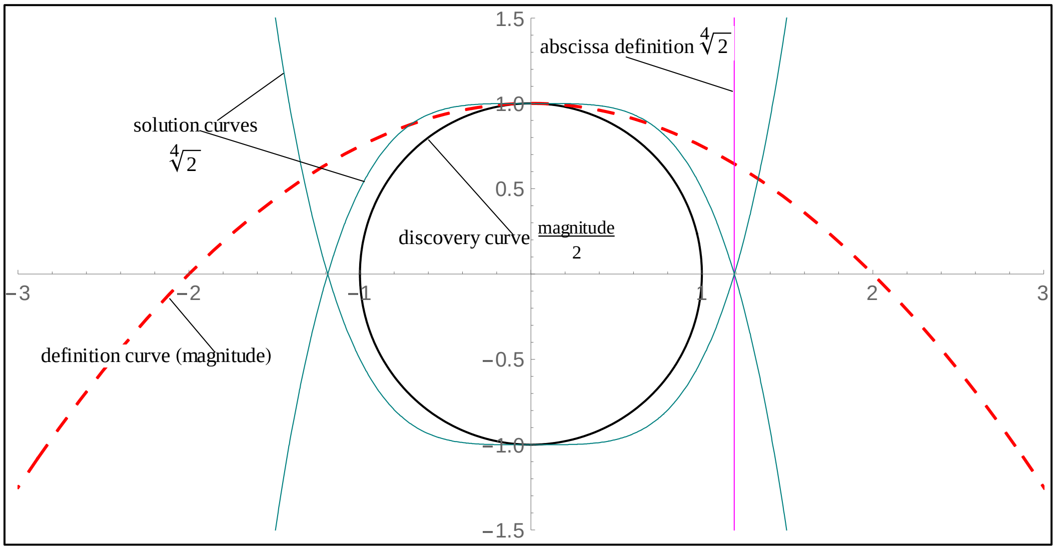


Figure 5: Curved Space Construction for $\sqrt{2}$. Abscissa definition is $\sqrt{2}$. Both solution curves intercept $\sqrt{2}$.

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).

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

$$\text{ParametricPlot}[\{\{\text{Cos}[t],\text{Sin}[t]\},\{t,\frac{t^2}{-4(1)}+1\},\{\sqrt[4]{2},t\},\{t,\frac{t^4}{-2}+\frac{2}{2}\},\{t,\frac{t^4}{+2}-\frac{2}{2}\}\},\{t,-\pi,\pi\},\text{PlotRange}\rightarrow\{\{-3,3\},\{\frac{-3}{2},\frac{3}{2}\}\}]$$



We see that *even* indices solution curves are parabolic shaped.

Figure 6: Curved Space Construction for $\sqrt[4]{2}$.

These are the methods to construct root of magnitude.

- Divide the considered magnitude by (2) to find the discovery radius. With the discovery radius construct a dependent parabola definition curve for magnitude.
- 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 circle.
- Solution curves for roots of magnitude:

$$\{t,\left(t^{desiredrootindice}/\mp 2\right)\pm(magnitude/2)\}$$

Curved space construction of$\left(\sqrt[3]{8}\right)$; to see the changing shape of solution curves

$$\text{ParametricPlot}[\{\{\frac{8}{2}\text{Cos}[t],\frac{8}{2}\text{Sin}[t]\},\{t,\frac{t^2}{-4\left(\frac{8}{2}\right)}+\frac{8}{2}\},\{t,\frac{t^3}{-2}+\frac{8}{2}\},$$
$$\{t,\frac{t^3}{+2}-\frac{8}{2}\},\{\sqrt[3]{8},t\}\},\{t,-3\pi,3\pi\},\text{PlotRange}\rightarrow\{\{-4,9\},\{-6,6\}\},$$

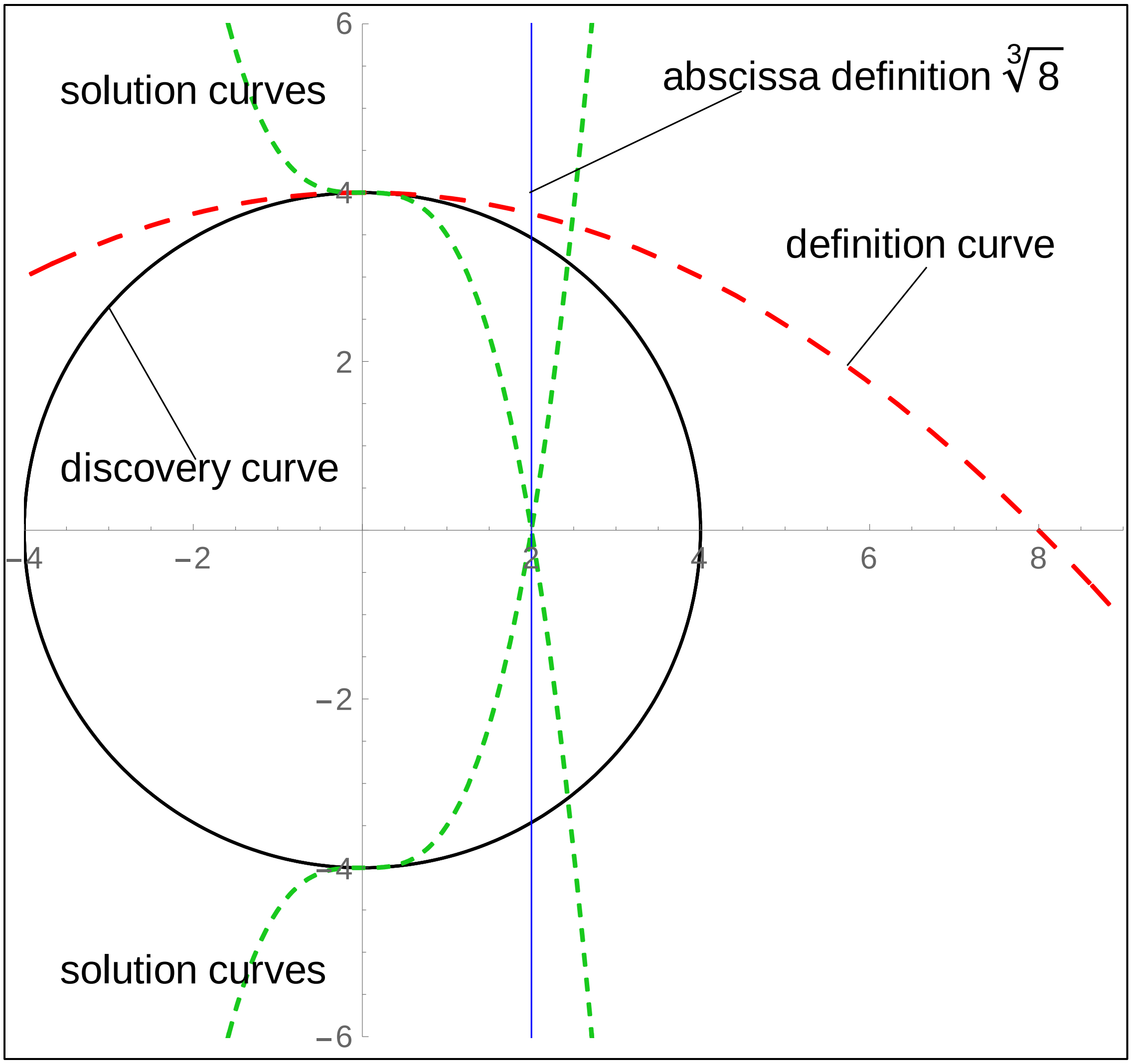


Figure 7: Curved Space Construction for $\sqrt[3]{8}$.

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

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

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

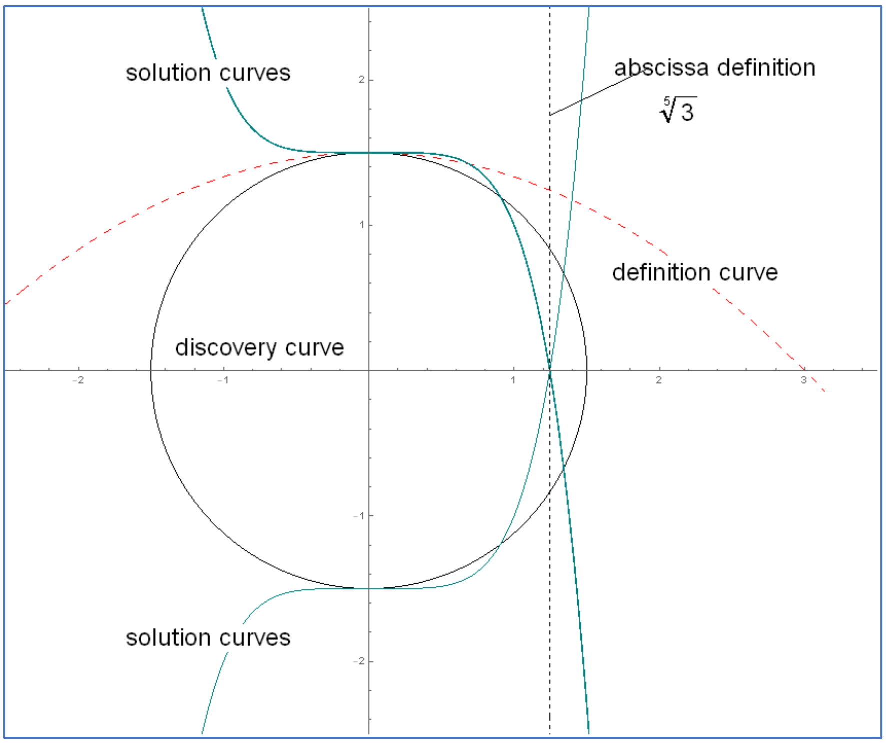


Figure 8: Curved Space Construction for $\sqrt[5]{3}$.

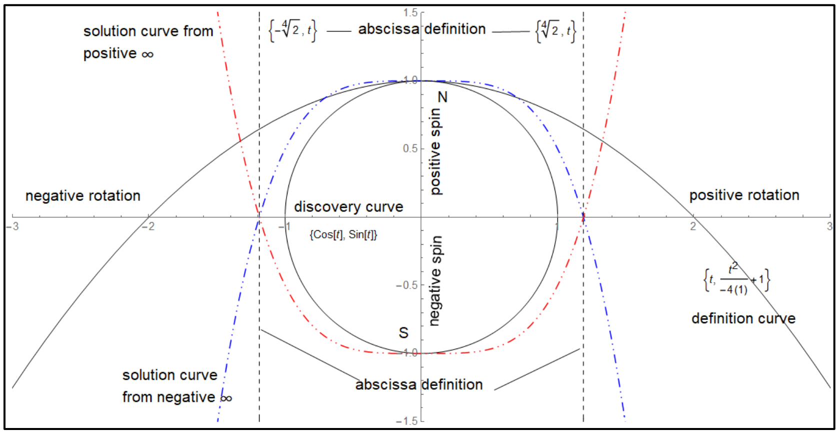
Rotation diameter end points also have definition. Rotation diameter of a **CSDA** is found as chord of the dependent parabola curve. Its parametric geometry name is the system Latus Rectum parabola chord with ends E & W. W is (π; 180°) and E is (0°or 2π; 360°).

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

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

EVEN INDICES $\sqrt[4]{2}$

$$\text{ParametricPlot}[\{\{\text{Cos}[t],\text{Sin}[t]\},\{t,\frac{t^2}{-4(1)}+1\},\{\sqrt[4]{2},t\},\{-\sqrt[4]{2},t\},\{t,\frac{t^4}{-2}+\frac{2}{2}\},\{t,\frac{t^4}{+2}-\frac{2}{2}\}\},\{t,-\pi,\pi\},\text{PlotRange}\rightarrow\{\{-3,3\},\{\frac{-3}{2},\frac{3}{2}\}\}]$$



even indices seem to favor two root abscissa ID. One on negative side of discovery curve and one on the positive side.

Figure 9: **CSDA** curved space construction of even indices for roots of magnitudes.

ODD INDICES: seem to favor root abscissa ID on the positive side of discovery spin.

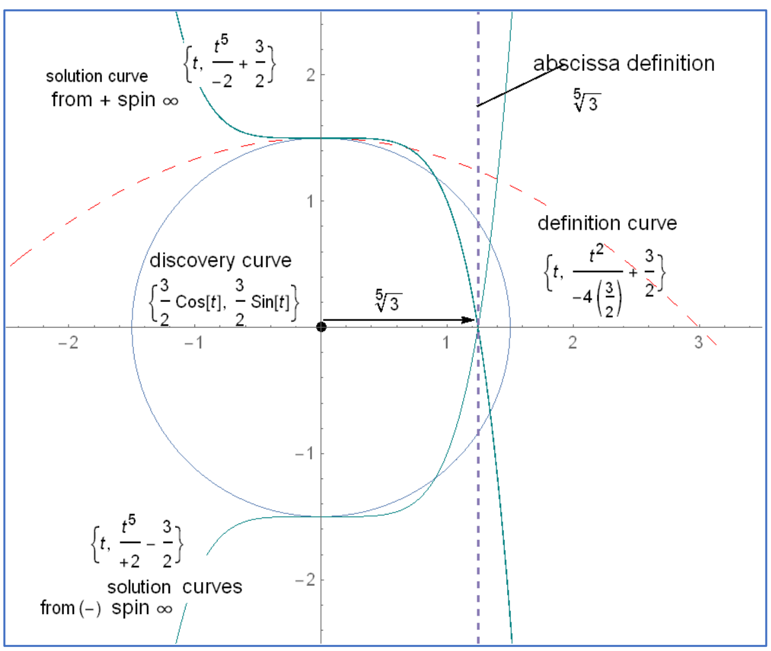


Figure 10: **CSDA** construction defining shape of odd indices.

on signing CSDA spin-rotation space:

Positive (y) is positive side of rotation.

Negative (y) is negative side of rotation.

Negative (x) is negative side of spin.

Positive (x) is positive side of spin.

PART 2: LINES of CURVED SPACE and SQUARE SPACE and philosophy of CURVED SPACE CENTER of CURVATURE and RADIUS of CURVATURE

The first line was a Euclidean definition, uniquely defined by two endpoints.

A ←——————————→ B (shortest distance between two points).

A Euclidean line has no width, has meter of length only: $\overleftrightarrow{AB}$

A **CSDA** curved space line also has two endpoints. Curvature and radius of that curvature, two endpoints presenting two *viewpoints* residing opposite each other, positioned from, across, and separated by two infinities. Radius, a conceptual length we can hold and measure populates macro infinite space; curvature, the inverse of radius, is a number only and has residence confined to the micro infinity space. Curvature evaluation does carry an assignment; center of curvature, when discovering radius of curvature in coutless imagined curves of our space.

I refer to Connecting Principal of a **CSDA** when studying Natural curves and lines constructing roots for **CSDA** Analytics.

Center of Curvature and radii of curvature are linear endpoints in a unit *relative* curved space. By unit relative I mean $\left(independent\ \left(\frac{\pi}{2}\right)\ spin = dependent\ (p)\right)$

Euclid's line, when defining radii, begins with center and origin of square space.

Center of curvature and radius of curvature, when considered as curved space definition of a circles curvature and radius are not the same as a square space (r).

	Circle radius unit meter	Curvature evaluation	Centering radius of curvature	Radius of curvature	Linear length radii square space	Linear length curved space
Square space	2	1/2	Origin	2	2units	
	3	1/3	Origin	3	3units	
	1/3	3	Origin	1/3	1/3unit	
Curved space	2		1/2	2	$\left(2-\frac{1}{2}=\frac{3}{2}\right)$	$\left(\frac{3}{2}\right)$unit
	3		1/3	3	$\left(3-\frac{1}{3}=\frac{5}{3}\right)$	$\left(\frac{5}{3}\right)$unit

PROPRTIES OF CURVED SPACE DIVISION ASSEMBLY (CSDA©):

Principal of linear radii and curvature relativity. For any radius of curvature (*r*) produced in the macro infinity there can exist one and only one inverse representation of this radius as curvature in the micro infinity. Micro infinity evaluation of curvature and radius will be $[(1/r)^{-1} = r]$.

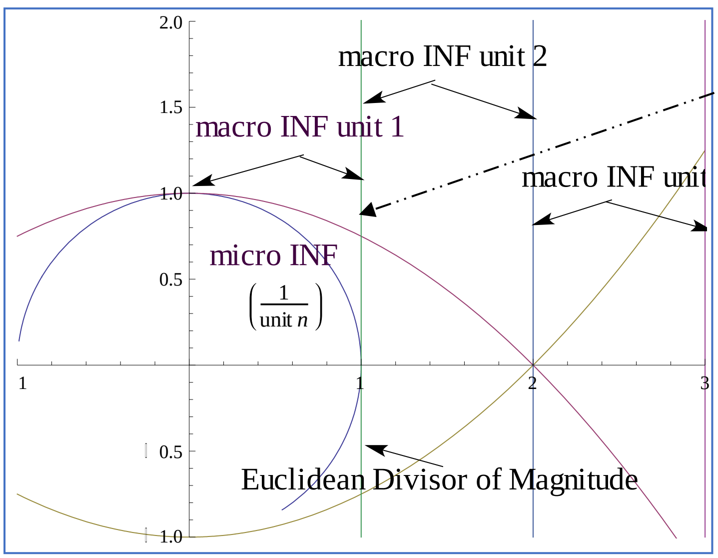


Figure 11: Euclid's divisor determines unit meter 'one' of a **CSDA** number line.

Euclid's divisor splits magnitude into two parts finding a unit circle radius for division of magnitude space with a **CSDA©**.

Micro infinity holds the set of all inverse integers from center *to* unit circle circumference defined with Euclid's divisor.

Macro infinity holds the set of all integers from unit circle circumference and beyond.

CONNECTING PRINCIPAL BETWEEN CURVED SPACE AND SQUARE SPACE:

For any radius of curvature (r) produced in the macro infinity there can exist one and only one inverse representation of this radius as curvature in the micro infinity.

Micro infinity evaluation of curvature and radius will be $[(1/r)^{-1} = r]$.

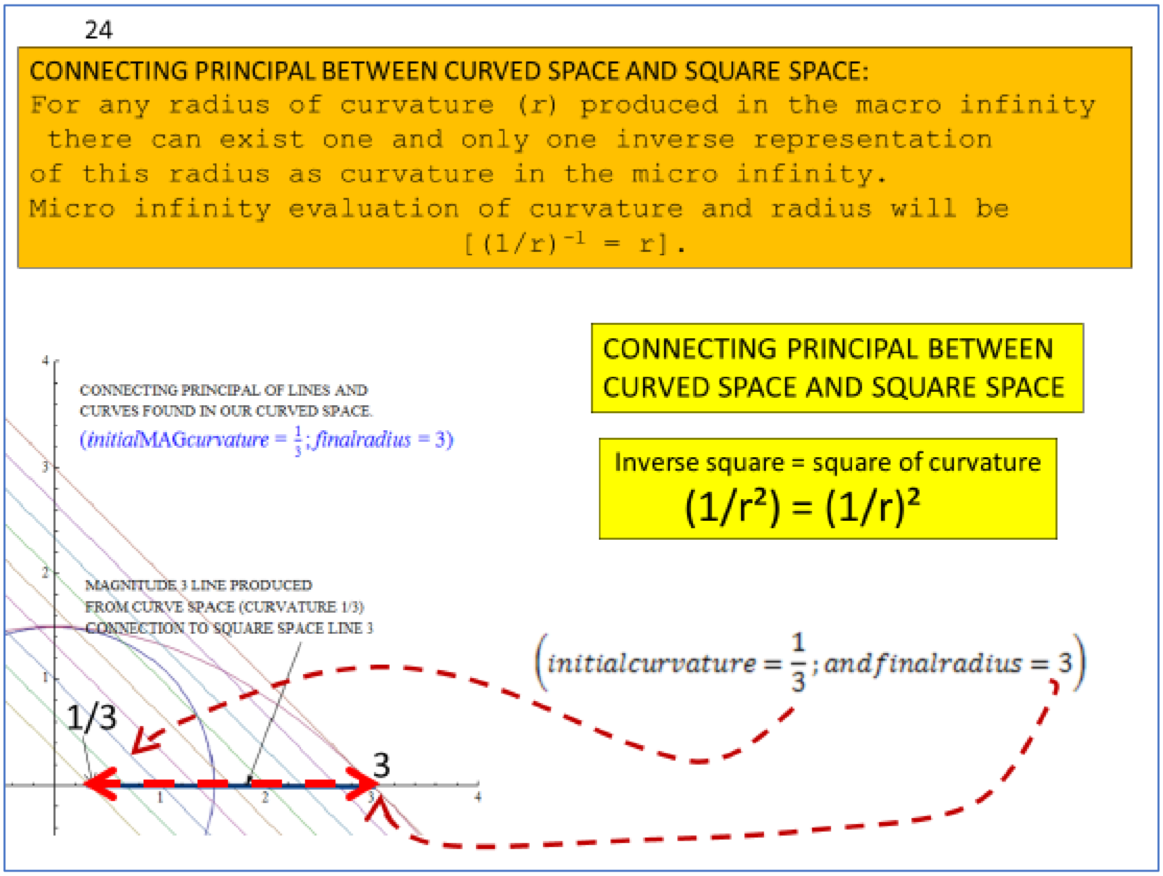


Figure 12: when a line 3 units long is divided into thirds, using Euclidean division, we have an 'inverse' of multiplication. A series of nine division diagonals producing a nine-unit space square. It is with this square I construct a central relative curved space centering function using two Euclidean curves. A circle and a parabola to read curvature and radius of curvature connection principal, to meter square space using curves by creating a linear view connecting micro (curvature) and macro (radius) infinities.

CSDA curved space analytic construction of curvature and radii of space curves having roots born of even integer indices. $(\sqrt[8]{7})$ radius view.

$(\sqrt[8]{7})$ **CSDA** curved space radii evaluation of even indices roots of magnitude.

$$\text{ParametricPlot}[\{\{\tfrac{7}{2}\text{Cos}[t], \tfrac{7}{2}\text{Sin}[t]\}, \{t, \frac{t^2}{-4\left(\frac{7}{2}\right)} + \frac{7}{2}\}, \{t, (\frac{t^8}{-2} + \frac{7}{2})\}, \{t, (\frac{t^8}{+2} - \frac{7}{2})\}, \{\sqrt[8]{7}, t\}, \{-\sqrt[8]{7}, t\}\}, \{t, -8, 8\}, \text{PlotRange} \text{->} \{\{-7, 7\}, \{-4, 4\}\}, \text{AxesOrigin} \text{->} \{0, 0\}]$$

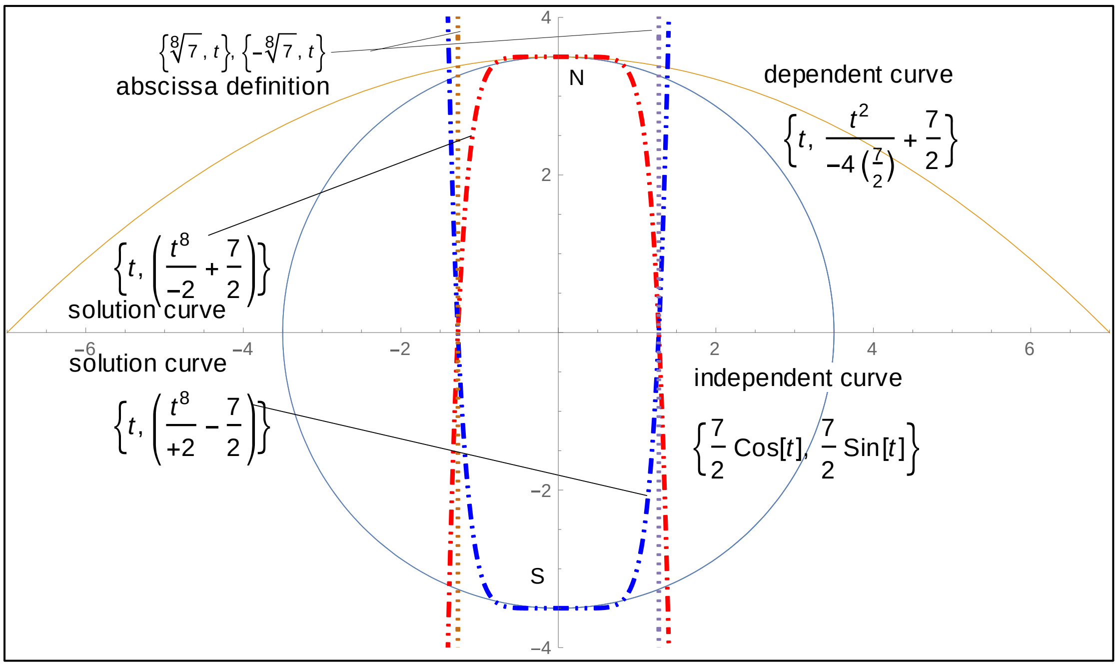


Figure 13: **CSDA** construction $\{\sqrt[8]{7}, t\}$. (work curvature.nb)

When dependent part of solution curves become inversed $\{t, \left(\frac{t^8}{-2} + \frac{7}{2}\right)^{-1}\}, \{t, \left(\frac{t^8}{+2} - \frac{7}{2}\right)^{-1}\}$, solution curves suffer shape change; going from radii endpoint view to an inverse viewpoint, with respect to curvature, looking out to macro infinity along the **CSDA** inverse connector. Picture the same mechanical philosophy of an inverted image presented to our brain by our eyes. The parabolic shaped curves fly apart, becoming asymptotic with respect to abscissa definition $\pm\sqrt[8]{7}$. Only dependent parts of solution curves are inversed.

$$\{t, (\frac{t^8}{\pm 2} \mp \frac{7}{2})^{-1}\},$$

Both solution curves $\{t, (\frac{t^8}{-2} + \frac{7}{2})^{-1}\}, \{t, (\frac{t^8}{+2} - \frac{7}{2})^{-1}\}$, positive and negative, when inversed, are forbidden asymptote crossover (to reach rotation plane) defined by the independent red line curvature definition $\{t, \left(\frac{7}{2}\right)^{-1}\}$ provided by the independent curve $\left\{\frac{7}{2}\mathrm{Cos}[t], \frac{7}{2}\mathrm{Sin}[t]\right\}$. Note; inversed main body solution curves flatline when meeting linear curvature limits provided by independent discovery

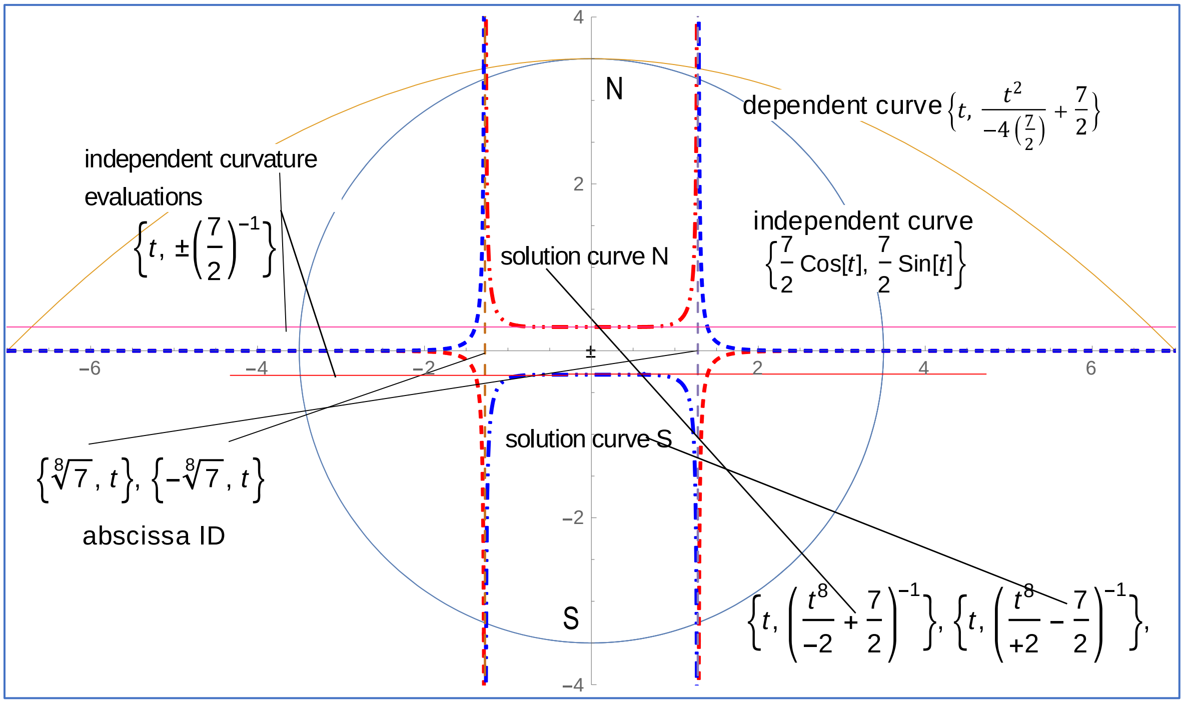


Figure 14: Sandbox construction of inversed solution curves for $\{\sqrt[8]{7}, t\}$ curvature view. (work curvature.nb)

curves.

The main body solution curves, both red and blue, are forever trapped between (±) abscissa ID of the root definition and linear curvature value of independent discovery curve. Note disassociation of solution curve character composition. Signed $(+\& -)$ parts composing solution curves, when inversed, disassociate from main body of curve, keeping $(+\& -)$ spirit from main body character. $(-)$ spirit of main body (red solution) approach the rotation plane from$(-spin\ \infty)$, outside asymptote frame $(\pm root\ abscissa\ ID)$. Once crossing the independent red line curvature definition $\{t, -\left(\frac{7}{2}\right)^{-1}$, turn to follow like signed rotation infinity, with respect to which side of abscissa ID red main body spirits arrive at rotation .

$(-spin\ \infty)$ has the main body blue solution curve vertex, spin axis centered. The positive solution curve is forbidden crossing the independent curvature definition $\{t, -\left(\frac{7}{2}\right)^{-1}$, and is protected with (±) root ID as asymptote insulator, keeping negative slope of red solution curve isolated from the positive slope character composing the blue (S) main body solution curve.

(±) spirit of main body (blue solution) approach rotation from $(+\ spin\ \infty)$ along $(\pm root\ abscissa\ ID)$, Once crossing the independent curvature ID definition $\{t, +\left(\frac{7}{2}\right)^{-1}$, turn to follow like signed rotation infinity.

Main body solution curve spirit parts become disassociated from main body curves when dependent composition of main body is inversed. $(\pm)$ parts of both main body solution curve composition, become asymptotic with plane of rotation *and* root abscissa identity. They cling close to main body solution curve of opposite character, $(-)$ spirit of red main body solution curve next to blue body curve, and $(+)$ spirit of main body blue solution curve next to red body curve. Close, but forever asymptoticly apart.

I sign the spirit of solution curves with this arbitrary convention. The solution curve touching $\left(\frac{\pi}{2}\right)$ spin vertex is (negative) because the unit parabola at this vertex is a negative slope 1st quadrant curve. The curve touching the $\left(\frac{3\pi}{2}\right)$ spin is a 4th quadrant positive slope curve.

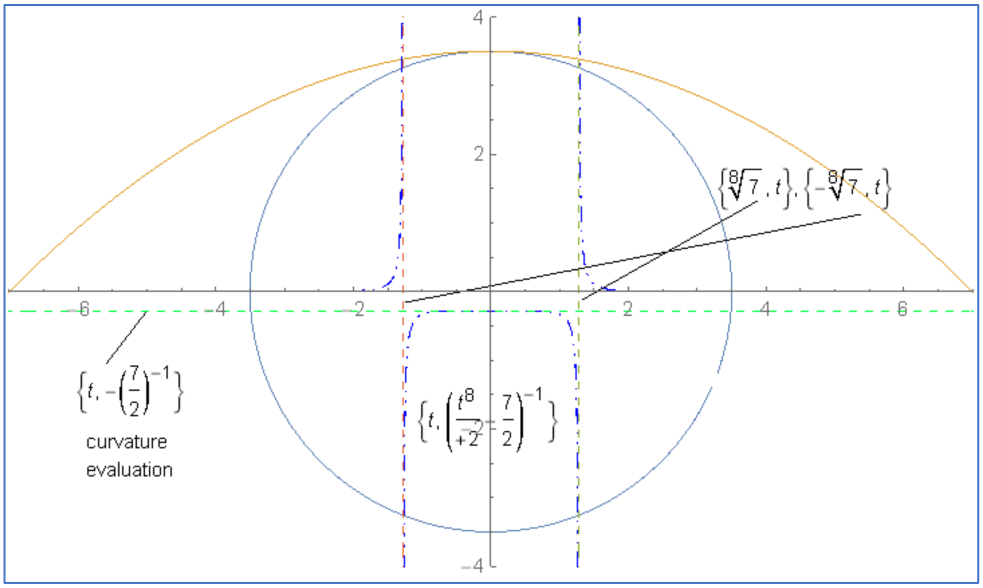


Figure 15: **CSDA** inverse of blue body solution curve (curvature viewpoint). (work curvature.nb)

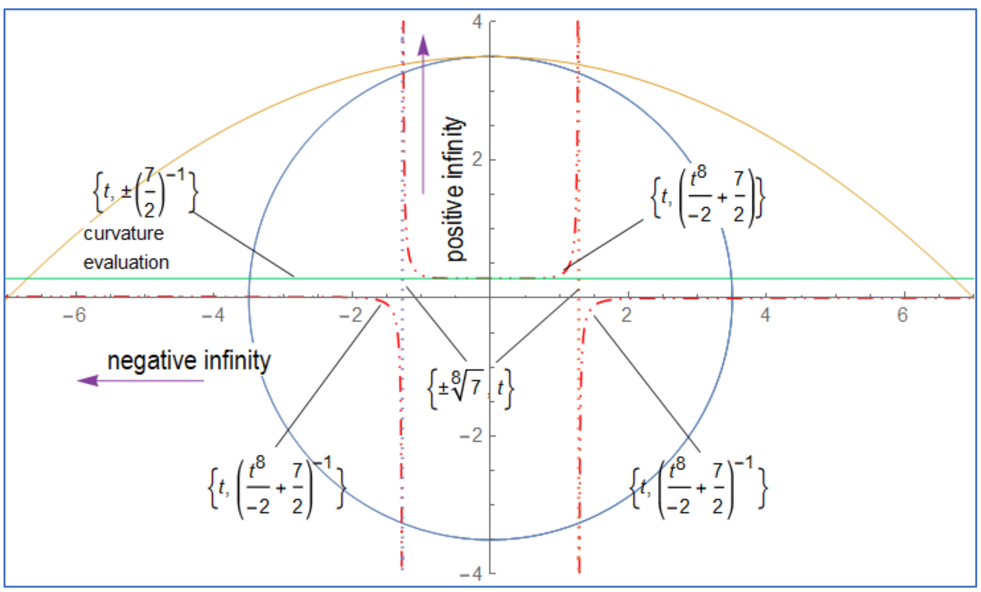


Figure 16: **CSDA** inverse of red body solution curve (curvature viewpoint). (work curvature.nb)

QED: Even indices solution curves and their inverse.

ALΣXANDΣR

CSDA construction curvature and radii of curves of roots having odd integer indices.

$(\sqrt[7]{7})$ square space curve analytics (radius view) of inverse square connector.

$$\text{ParametricPlot}[\{\{\tfrac{7}{2}\text{Cos}[t],\tfrac{7}{2}\text{Sin}[t]\},\{t,\frac{t^2}{-4\left(\frac{7}{2}\right)}+\frac{7}{2}\},\{t,(\frac{t^7}{+2}-\frac{7}{2})\},\{t,(\frac{t^7}{-2}+\frac{7}{2})\},\{\sqrt[7]{7},t\},\{-\sqrt[7]{7},t\}\},\{t,-8,8\},\text{PlotRange}\text{->}\{\{-7,7\},\{-4,4\}\},\text{AxesOrigin}\text{->}\{0,0\}]$$

CSDA macro space odd indices radii connection sketch unidirectional solution curves, approach **CSDA** parametric geometry function along *negative* side of spin infinity along positive side of negative abscissa root ID. When crossing over to *positive* side of spin space, they flatline at N & S vertices before diving toward

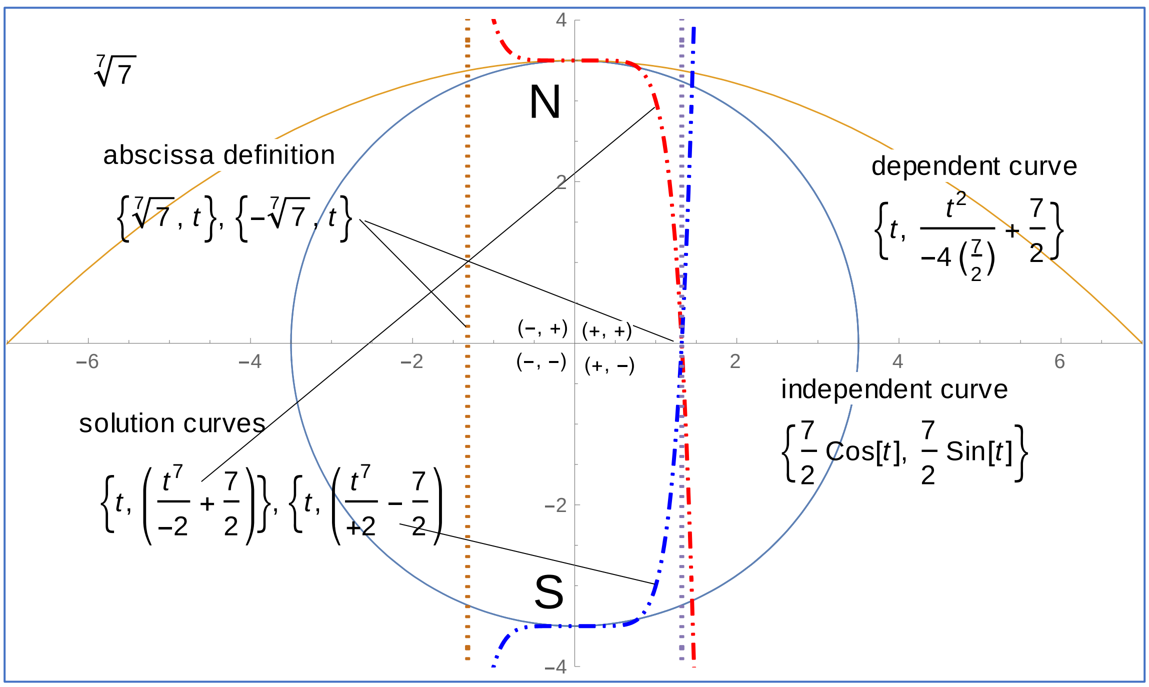


Figure 17: **CSDA** macro space radii evaluation of roots having odd indices: $\{\sqrt[7]{7}, t\}, \{-\sqrt[7]{7}, t\}$. (work curvature.nb)

root definition on rotation plane. Root definition happens on positive side of spin. Both curves continue unidirectional on **CSDA** positive spin side, crossing over to like signed spin infinities on positive side of root abscissa ID with respect to rotation. Negative red on to $(-\,spin\ \infty)$ and positive blue on to $(+\,spin\ \infty)$.

($\sqrt[7]{7}$) curved space curve analytics (curvature view) of inverse square connector.

$$\text{ParametricPlot}[\{\{\tfrac{7}{2}\text{Cos}[t],\tfrac{7}{2}\text{Sin}[t]\},\{t,\frac{t^2}{-4\left(\frac{7}{2}\right)}+\frac{7}{2}\},\{t,\left(\frac{t^7}{+2}-\frac{7}{2}\right)^{-1}\},\{t,\left(\frac{t^7}{-2}+\frac{7}{2}\right)^{-1}\},$$

$$\{\sqrt[7]{7},t\},\{-\sqrt[7]{7},t\},\{t,(\tfrac{7}{2})^{-1}\},\{t,-(\tfrac{7}{2})^{-1}\},\{14^{1/7},t\}\},\{t,-8,8\},\text{PlotRange}\text{->}\{\{-7,7\},\{-4,4\}\},\text{AxesOrigin}\text{->}\{0,0\}]$$

Both square space unidirectional solution curves (±) character spirit are split from the inversed main body curve.

The up-spin spirit of red main body solution curve approach rotation from ($-spin\ \infty$) alongside positive root abscissa ID asymptote, turns right (eye sight into paper) and recedes to positive rotation infinity.

The down-spin spirit of red main body solution curve approaches rotation along

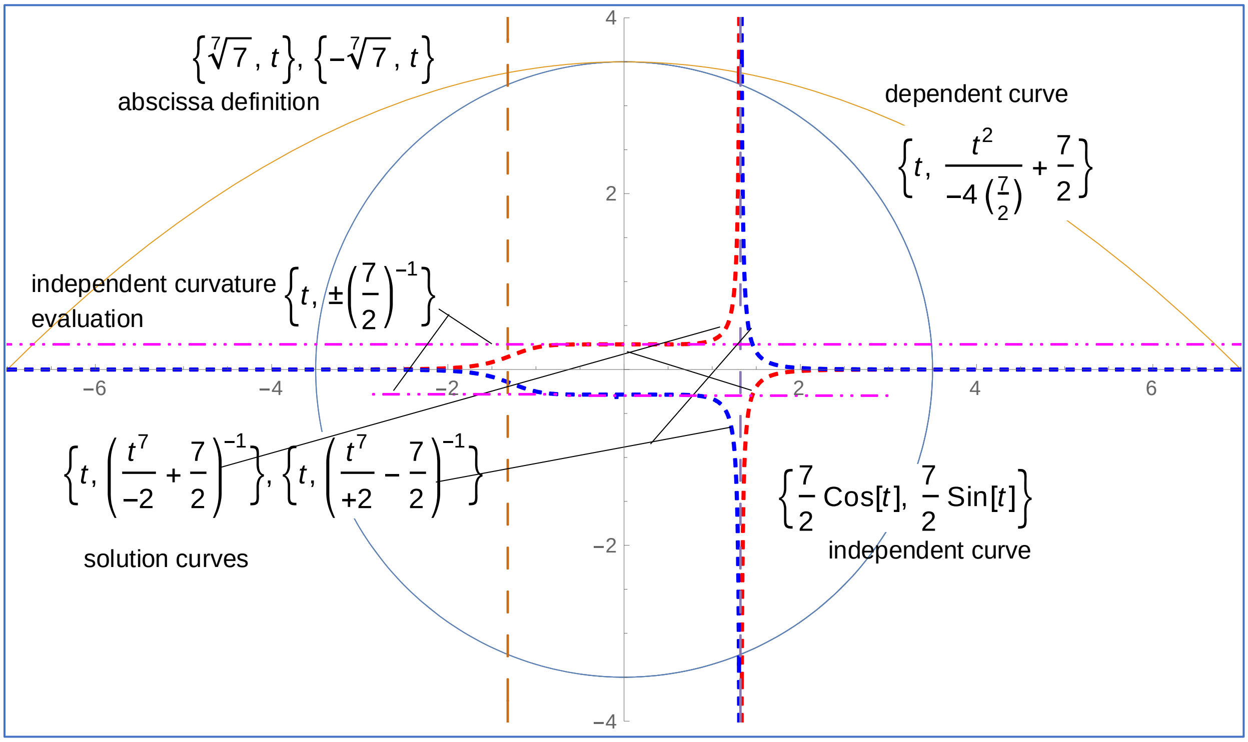


Figure 18: curved space view of inversed odd indices. Odd indices of square space radii produce unidirectional solution curves. Change shape and asymptote when inversed: $\{t,\left(\frac{t^7}{+2}-\frac{7}{2}\right)^{-1}\},\{t,\left(\frac{t^7}{-2}+\frac{7}{2}\right)^{-1}\}$

negative side of positive abscissa root ID from ($+spin\ \infty$). Upon reaching the positive independent curvature limit $\left(\frac{7}{2}\right)^{-1}$, the curve flatlines, turns left, (eye sight into paper), and collapses onto rotation plane just past negative root ID, and recedes out to negative infinite square space rotation.

The down-spin spirit of blue main body solution curve approach rotation from $(+spin\ \infty)$ along positive side of positive root abscissa ID asymptote, turns right (eye sight into paper) and recedes to positive rotation infinity.

The up-spin spirit of main body blue solution curve approaches rotation along negative side of positive abscissa root ID from $(-spin\ \infty)$. Upon reaching the negative independent curvature limit $\left(\frac{-7}{2}\right)^{-1}$, the curve flatlines, turns left, (eye sight into paper), and collapses onto rotation plane just past negative root ID, and recedes out to negative infinite square space rotation.

QED: Odd indices solution curves and their inverse.

ALΣXANDΣR

Since I have signed red main body solution curves negative and blue body solution curves positive; I propose the following convention.

- Let curve direction point from infinite space to plane of rotation.
- If on a positive spin axis, or relative spin asymptote, such a curve needs down spiral, down-spin, to arrive at rotation.
- If on a negative spin axis, or relative spin asymptote, such a curve needs up spiral, up-spin, to reach rotation.
- Those curves out in infinite space of rotation, also have direction toward spin. Signing is arbitrary as to side of spin and sides of relative spin asymptotes. Those curves approaching central spin or relative central spin asymptotes from $(\pi)\ space\ rotation$ with respect spin, come from negative (left-side) infinity and are negative. Those curves approaching central spin or relative central spin asymptotes from $(2\pi)\ space$, come from positive (right-side) infinity and have positive spirit.

Even indices root constructions, when inversed, produce 3 apparitions. The main body captured between root ID and curvature limits of discovery and two spirit outside capture zone. Odd indices suffering mechanical inverse, produce only two apparition. I suspect the curves suffering flatline curvature limits asymptote is main body, the one reaching rotation unimpeded, are odd indices spirit curves.

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PART3: Trancensdentals Indices $\{\sqrt[\pi]{2}, t\}$

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

$$\{\sqrt[\pi]{2}, t\}\}, \{t, -4, 4\}, \text{PlotRange}{-}{>} \{\{-3,3\}, \{-3,3\}\}, \text{AxesOrigin}{-}{>} \{0,0\}]$$

By (my own) convention, I use signing of dependent curve @ $\left(\frac{\pi}{2}\right)$ spin vertices $\left(\frac{+t^n}{-4(p)} + r\right)$. I also use color so as to follow spin vertex solution curves as we

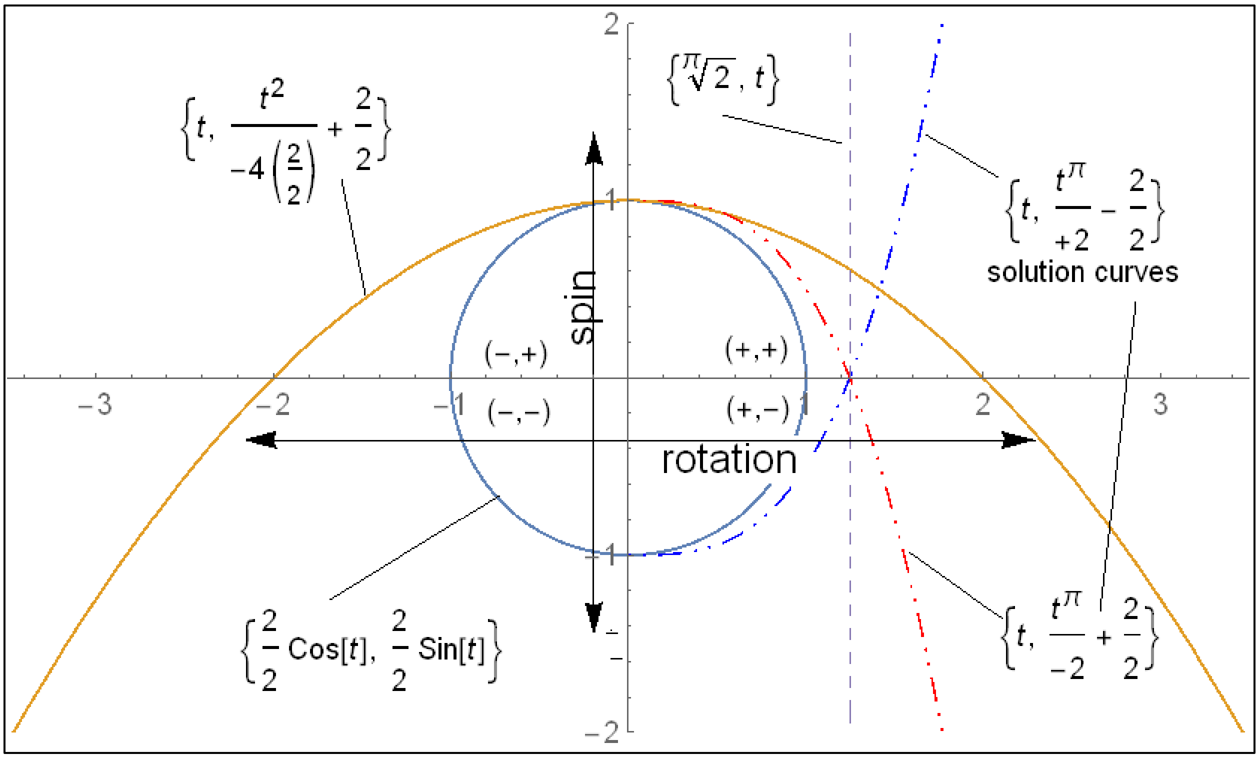


Figure 19: transcendental root $\{\sqrt[\pi]{2}, t\}$, macro space radii view. transcendental roots 1.nb

change constructed space view by inversing dependent parts of solution curves.

We see $\left(\frac{\pi}{2}\right)$ spin vertex is primitive origin for red negative solution curve.

We see $\left(\frac{3\pi}{2}\right)$ spin vertex is primitive origin for blue positive solution curve.

Transcendental solution curves source from positive side of spin. negative solution exists above rotation and positive solution below rotation.

inverse curvature evaluation of transcendental $\{\sqrt[\pi]{2}, t\}$

Same convention. Red negative main body solution curve still sources from $\left(N; \frac{\pi}{2}\right)$ spin vertex and blue positive main body solution curve still sources from $\left(S; \frac{3\pi}{2}\right)$ spin vertex

$$\text{ParametricPlot}[\{\{\frac{2}{2}\text{Cos}[t], \frac{2}{2}\text{Sin}[t]\}, \{t, \frac{t^2}{-4\left(\frac{2}{2}\right)} + \frac{2}{2}\}, \{t, \left(\frac{t^\pi}{+2} - \frac{2}{2}\right)^{-1}\}, \{t, \left(\frac{t^\pi}{-2} + \frac{2}{2}\right)^{-1}\}, \{\sqrt[\pi]{2}, t\}\}, \{t, -4{,}4\}, \text{PlotRange}\text{->} \{\{-7/2\,, 7/2\}, \{-7/2\,, 7/2\}\}, \text{AxesOrigin}\text{->} \{0{,}0\}]$$

Note: both main body solution curves still source from positive side of spin.

Inversing solution curves; $\{t, (\frac{t^\pi}{+2} - \frac{2}{2})^{-1}\}, \{t, (\frac{t^\pi}{-2} + \frac{2}{2})^{-1}\}$, causes $(positive\ \text{ or } negative)$ spirit carried by each main body curve, to become separated from primitive source point of origin. Both root solution curves source from (spin axis) vertices. When solution curves are inversed, the abscissa root ID becomes asymptotic keeping separate main body solution curves from acompanying spirit curves.

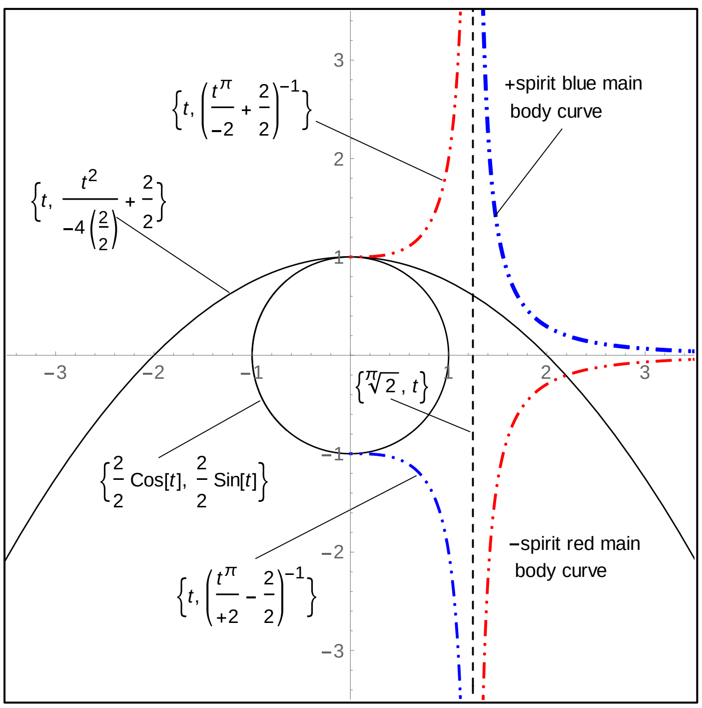


Figure 20: transcendental root $\{\sqrt[\pi]{2}, t\}$ inversed, micro space curvature view. transcendental roots 1.nb

Note distribution of spirit signing connected with inversed main body curve. Negative spirit south of rotation and positive spirit north of rotation.

Blue spirit approach is from $(+spin\infty)$, turns right (eyesight into paper) and recedes to $(+rotation\infty)$.

Red spirit approach is from $(-spin\infty)$, turns right (eyesight into paper) and recedes to $(+rotation\infty)$.

CSDA demonstration $\left(\sqrt[\pi]{3}\right)$ center of curvature to macro space radii evaluation

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

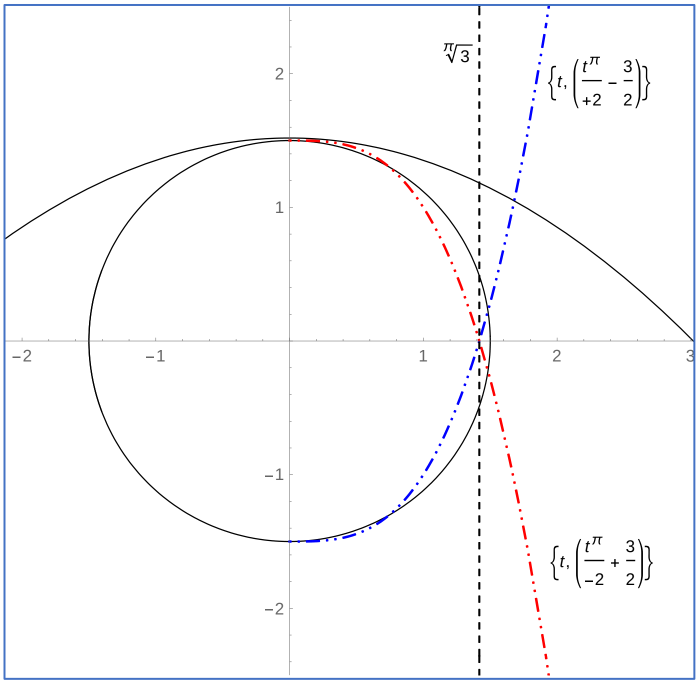


Figure 21: : transcendental root $\{\sqrt[\pi]{3},t\}$ macro space radii view.
transcendental roots 1.nb

Red is negative main body solution curve.

Blue is positive main body solution curve

Radicand number has been changed from (2) to (3)

Root solution has become part of micro infinity discovery curve.

Both main body solution curves still source from N&S discovery curve spin vertices.

We see $\left(\frac{\pi}{2}\right)$ spin vertex is primitive origin for red negative solution curve.

We see $\left(\frac{3\pi}{2}\right)$ spin vertex is primitive origin for blue positive solution curve.

Transcendental solution curves source from positive side of spin. negative solution exists above rotation and positive solution below rotation.

CSDA demonstration $\left(\sqrt[\pi]{3}\right)$ Inversed Curvature view evaluation

$$\text{ParametricPlot}[\{\{\tfrac{3}{2}\text{Cos}[t],\tfrac{3}{2}\text{Sin}[t]\},\{t,\frac{t^2}{-4\left(\frac{3}{2}\right)}+\frac{3}{2}\},\{t,(\frac{t^\pi}{-2}+\frac{3}{2})\},\{t,(\frac{t^\pi}{+2}-\frac{3}{2})\},\{t,\frac{2}{3}\},\{t,\frac{-2}{3}\},\{t,\left(\frac{t^\pi}{-2}+\frac{3}{2}\right)^{-1}\},\{t,(\frac{t^\pi}{+2}-\frac{3}{2})^{-1}\},\{\sqrt[\pi]{3},t\}\},\{t,-\frac{7}{2},\frac{7}{2}\},\text{PlotRange}\text{->}\{\{-\frac{7}{2},\frac{7}{2}\},\{-\frac{5}{2},\frac{5}{2}\}\},\text{AxesOrigin}\text{->}\{0,0\}]$$

Abscissa ID $\{\sqrt[\pi]{3},t\}$ and independent curve $\{\frac{3}{2}\text{Cos}[t],\frac{3}{2}\text{Sin}[t]$ curvature limits $\{t,\frac{2}{3}\},\{t,\frac{-2}{3}\}$ are relative spin/rotation asymptotes of magnitude 3 inverse square connector.

Solution curves still source from positive side of spin @ $\left(\frac{\pi}{2}\ and\ \frac{3\pi}{2}\right)$ vertices. But *inversed* solution curves source from positive side of spin @ $(+\ and\ -)$ curvature evaluation of independent **CSDA** curve $\{\frac{3}{2}\text{Cos}[t],\frac{3}{2}\text{Sin}[t]\}$ as relative rotation asymptotes.

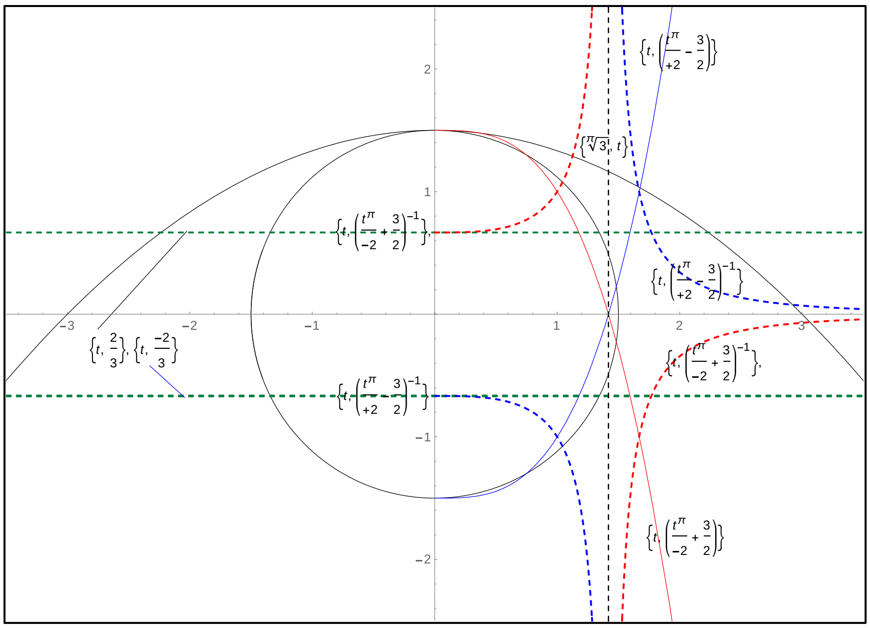


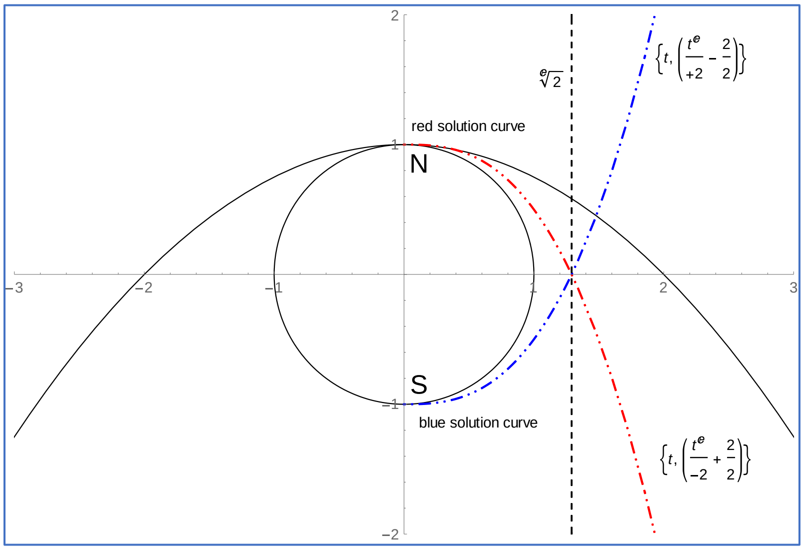
Figure 22: **CSDA** curved space parametric geometry construction for magnitude root $\{\sqrt[\pi]{3},t\}$ inverse. Note inversed curves no longer source from spin vertices, but still source from positive side spin axis along curvature limits of independent central force curve. transcendental roots 1.nb

Positive spirit of blue main body solution curve approaches rotation plane from $(+spin\infty)$, turns right (eyesight into paper) and recedes to $(+rotation\infty)$.

Red spirit approach is from $(-spin\infty)$, turns right (eyesight into paper) and recedes to $(+rotation\infty)$.

$\{\sqrt[e]{2}, t\}$

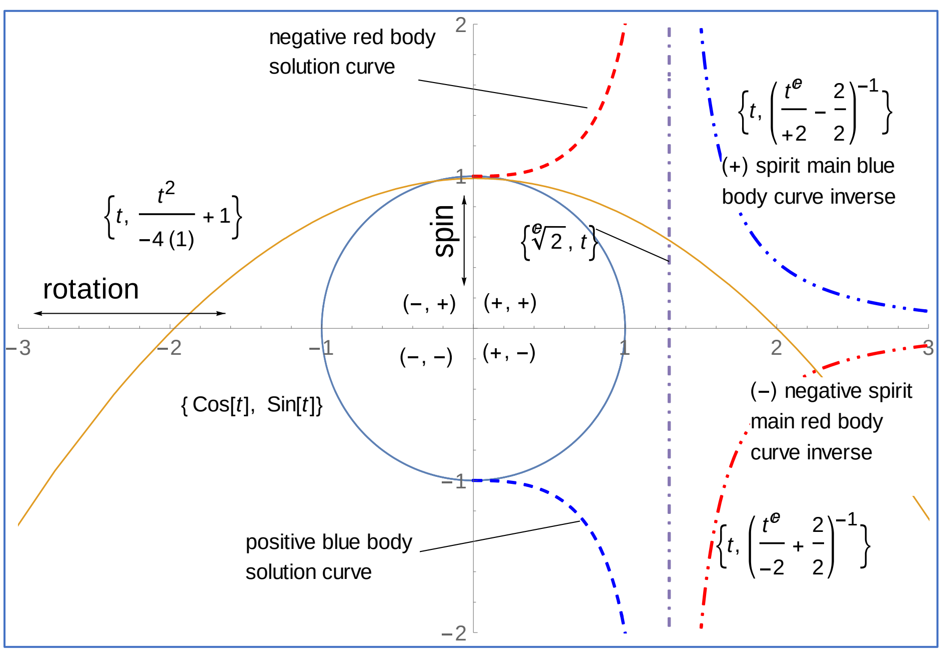
$$\text{ParametricPlot}[\{\{\text{Cos}[t], \text{Sin}[t]\}, \{t, \frac{t^2}{-4(1)} + 1\}, \{t, (\frac{t^e}{-2} + \frac{2}{2})\}, \{t, (\frac{t^e}{+2} - \frac{2}{2})\}, \{\sqrt[e]{2}, t\}\}, \{t, -\pi, \pi\},$$
$$\text{PlotRange} -> \{\{-3,3\}, \{-2,2\}\}, \text{AxesOrigin} -> \{0,0\}]$$



Exponential (e) as index for radicand (2) seems to possess same parameters as (π).

Figure 23: CSDA parametric geometry construction of transcendental $\{\sqrt[e]{2}, t\}$. transcendental roots 1.nb

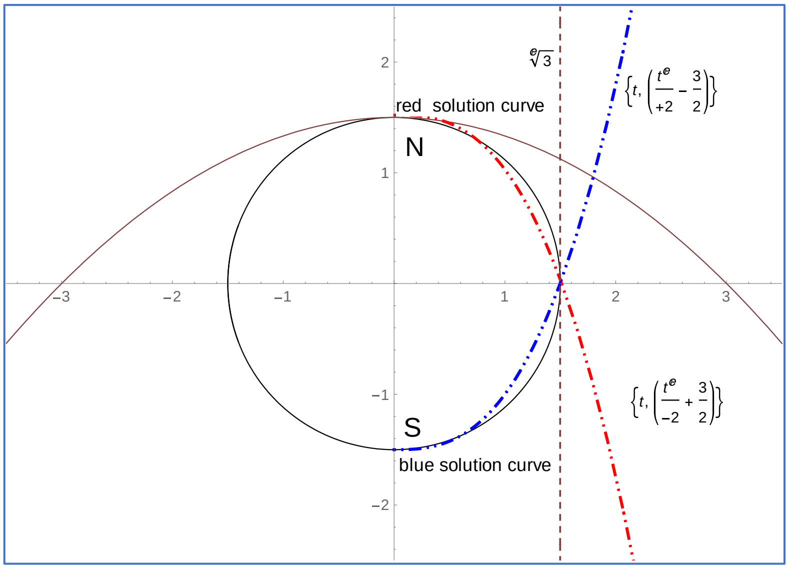
$$\text{ParametricPlot}[\{\{\text{Cos}[t], \text{Sin}[t]\}, \{t, \frac{t^2}{-4(1)} + 1\}, \{t, \left(\frac{t^e}{-2} + \frac{2}{2}\right)^{-1}\}, \{t, \left(\frac{t^e}{+2} - \frac{2}{2}\right)^{-1}\}, \{\sqrt[e]{2}, t\}\}, \{t, -9, 9\},$$
$$\text{PlotRange} -> \{\{-3,3\}, \{-2,2\}\}, \text{AxesOrigin} -> \{0,0\}]$$



Inversing Exponential (e) as index for radicand (2) seems to possess same parameters as (π) as index for radicand (2).

Figure 24: CSDA parametric geometry construction of transcendental $\{\sqrt[e]{2}, t\}$. transcendental roots 1.nb

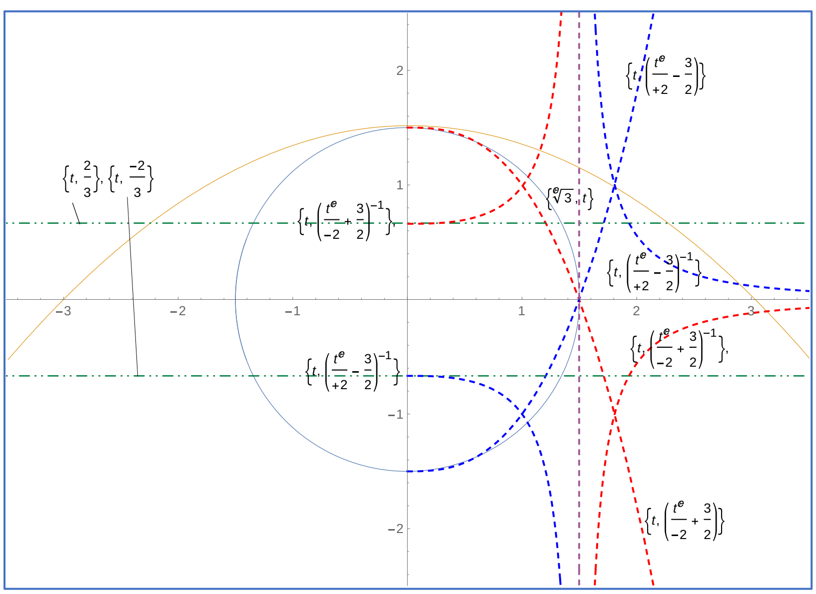
$$\text{ParametricPlot}[\{\{\tfrac{3}{2}\text{Cos}[t],\tfrac{3}{2}\text{Sin}[t]\},\{t,\tfrac{t^2}{-4\left(\frac{3}{2}\right)}+\tfrac{3}{2}\},\{t,(\tfrac{t^e}{-2}+\tfrac{3}{2})\},\{t,(\tfrac{t^e}{+2}-\tfrac{3}{2})\},\{t,\tfrac{2}{3}\},\{t,\tfrac{-2}{3}\},\{t,(\tfrac{t^e}{-2}+\tfrac{3}{2})\},\{t,(\tfrac{t^e}{+2}-\tfrac{3}{2})\},\{\sqrt[e]{3},t\}\},\{t,-\tfrac{7}{2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



$\{\sqrt[e]{3}, t\}$ Exponential (e); transcendental sameness.

Figure 25: CSDA parametric geometry construction of transcendental $\{\sqrt[e]{3}, t\}$ transcendental roots 1.nb

$$\text{ParametricPlot}[\{\{\tfrac{3}{2}\text{Cos}[t],\tfrac{3}{2}\text{Sin}[t]\},\{t,\tfrac{t^2}{-4\left(\frac{3}{2}\right)}+\tfrac{3}{2}\},\{t,(\tfrac{t^e}{-2}+\tfrac{3}{2})\},\{t,(\tfrac{t^e}{+2}-\tfrac{3}{2})\},\{t,\tfrac{2}{3}\},\{t,\tfrac{-2}{3}\},\{t,\left(\tfrac{t^e}{-2}+\tfrac{3}{2}\right)^{-1}\},\{t,\left(\tfrac{t^e}{+2}-\tfrac{3}{2}\right)^{-1}\},\{\sqrt[e]{3},t\}\},\{t,-\tfrac{7}{2},\tfrac{7}{2}\},\text{PlotRange}\text{->}\{\{-\tfrac{7}{2},\tfrac{7}{2}\},\{-\tfrac{5}{2},\tfrac{5}{2}\}\},\text{AxesOrigin}\text{->}\{0,0\}]$$



$\left(\sqrt[e]{3}\right)^{-1}$

exponential (e) transcendental sameness. Note main body solution curves source from discovery curve curvature limits.

Figure 26: CSDA parametric geometry construction of transcendental $\{\sqrt[e]{3}^{-1}, t\}$ inverse. transcendental roots 1.nb

transcendental index for radicand (8)

$$\text{ParametricPlot}[\{\{\tfrac{8}{2}\text{Cos}[t],\tfrac{8}{2}\text{Sin}[t]\},\{t,\tfrac{1}{4}\},\{t,\tfrac{-1}{4}\},\{t,\frac{t^2}{-4\left(\frac{8}{2}\right)}+\frac{8}{2}\},\{t,\left(\frac{t^{\pi}}{-2}+\frac{8}{2}\right)^{-1}\},\{t,\left(\frac{t^{\pi}}{+2}-\frac{8}{2}\right)^{-1}\},\{\sqrt[\pi]{8},t\}\},$$
$$\{t,-9,9\},\text{PlotRange}\text{->}\{\{-10,10\},\{-6,6\}\},\text{AxesOrigin}\text{->}\{0,0\}]$$

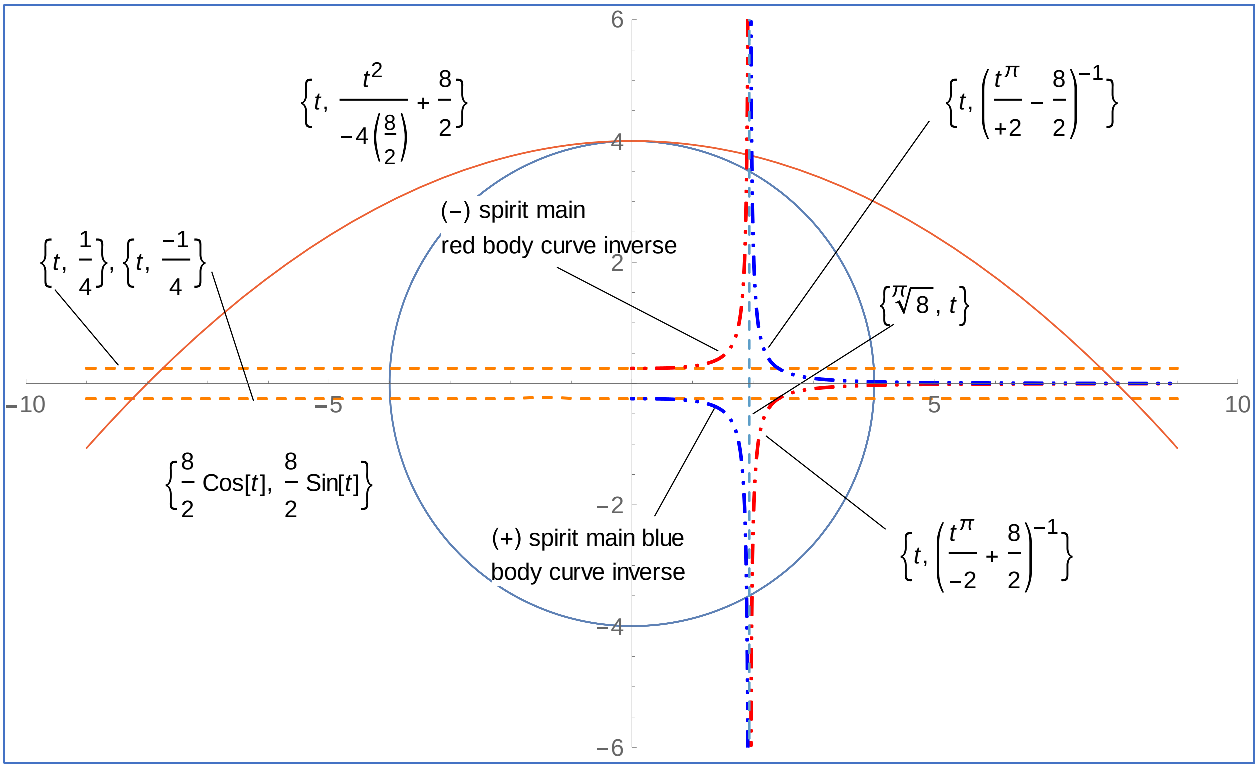


Figure 27: CSDA curved space construction of transcendental inversed root $\{\sqrt[\pi]{8}, t\}$

Even indices have negative and positive abscissa root identification. Curvature limits of discovery become relative rotation asymptotes. Root abscissa identities become relative spin asymptotes. Together, they give a precise infinite volume of operating space for **F**.

Odd indices use the positive abscissa root ID as relative spin asymptote. curvature limits of discovery are relative rotation asymptotes.

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Part 4

Phylosphical inquiry into interger radicand description of a centrist philosophy for constructing roots of magnitude for, 1-space, 2-space, 3-space, and 4-space.

When constructing roots of space curve magnitudes, I find no discernible change when conducting indices on radicand two. All root solutions (red&blue) source from **CSDA** spin axis N&S. I intend to use radicand (2) as descriptor of Natural 2-space central force construction. Background of such a construction is Cartesian. Let the origin be central force **F**. let $\left(\frac{\pi}{2} \& \frac{3\pi}{2}\right)$ direction radii spin, and $(\pi \& 2\pi)$ direction radii rotate.

$$\text{ParametricPlot}[\{\{\text{Cos}[t],\text{Sin}[t]\},\{t,\frac{t^2}{-4(1)}+1\},\{t,\frac{t^2}{+4(1)}-1\},\{\sqrt[1]{2},t\},\{t,\frac{t^1}{-2}+\frac{2}{2}\},\{t,\frac{t^1}{+2}-\frac{2}{2}\},$$
$$\{t,(\frac{t^1}{+2}-\frac{2}{2})^{-1}\},\{t,(\frac{t^1}{-2}+\frac{2}{2})^{-1}\},\{t,1\},\{t,-1\}\},\{t,-\pi,\pi\},\text{PlotRange}\rightarrow\{\{-3,3\},\{\frac{-3}{2},\frac{3}{2}\}\}]$$

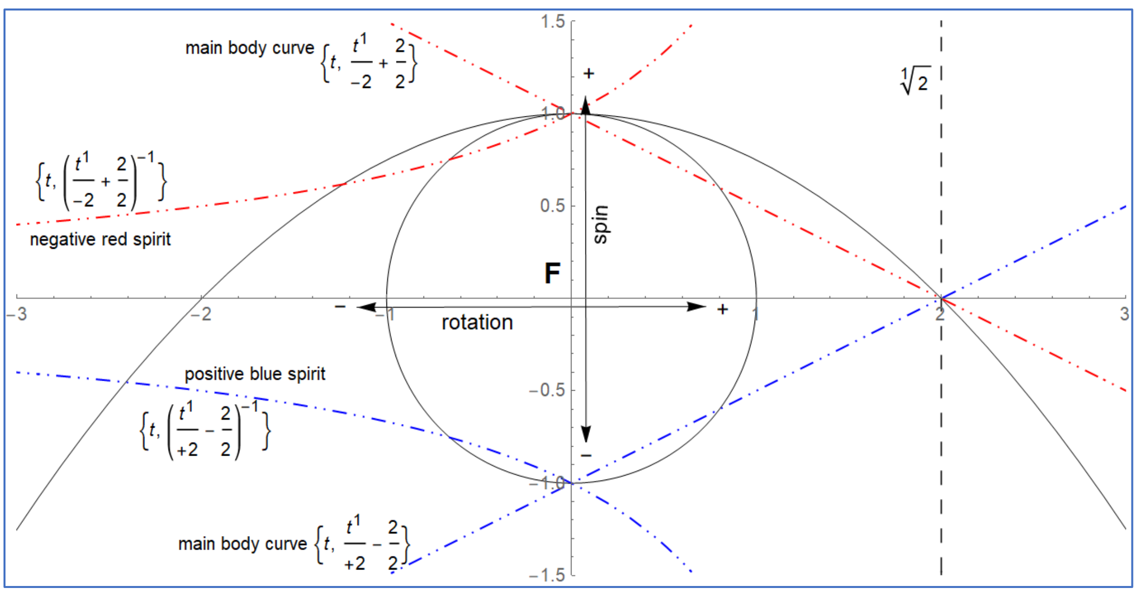

Figure 28: CSDA parametric geometry construction of 1st index linear (degree 1) root of Natural 2-space. Scratch curves.nb

- $\{t, \frac{t^1}{-2} + \frac{2}{2}\}, \{t, \frac{t^1}{+2} - \frac{2}{2}\}$. Negative and positive main body solution curves. Macro space radii into micro infinity curvature. Linear view into curved space .
- $\{t, (\frac{t^1}{+2} - \frac{2}{2})^{-1}\}, \{t, (\frac{t^1}{-2} + \frac{2}{2})^{-1}\}$. Inversed main body curves; curvature view out to macro space radii. Curves on negative side of spin in curved space become linear when rotation happens on square space side of spin.

Degree two (index 2) rotation magnitude root of Natural 2-space

$$\text{ParametricPlot}[\{\{\text{Cos}[t],\text{Sin}[t]\},\{t,\frac{t^2}{-4(1)}+1\},\{t,\frac{t^2}{+4(1)}-1\},\{\sqrt[2]{2},t\},\{t,\frac{t^2}{-2}+\frac{2}{2}\},$$
$$\{t,\frac{t^2}{+2}-\frac{2}{2}\},\{t,(\frac{t^2}{+2}-\frac{2}{2})^{-1}\},\{t,(\frac{t^2}{-2}+\frac{2}{2})^{-1}\}\},\{t,-\pi,\pi\},\text{PlotRange}\rightarrow\{\{-3,3\},\{\frac{-3}{2},\frac{3}{2}\}\}]$$

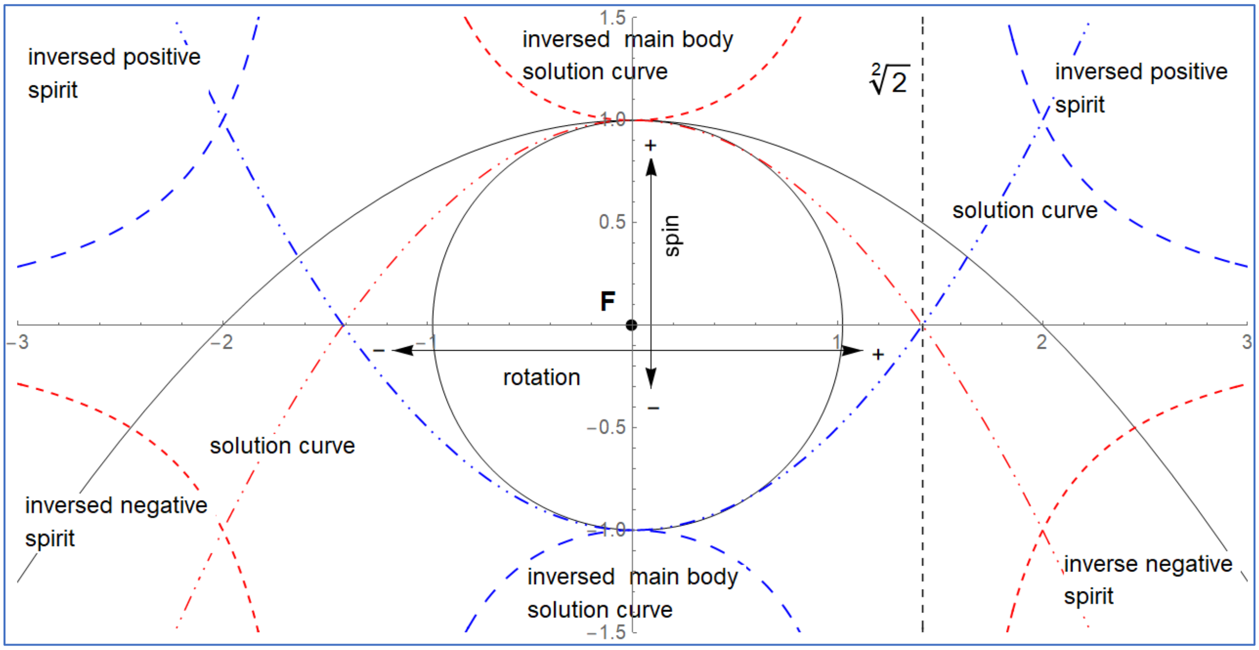

Figure 29: CSDA curved space construction of 2-space rotation magnitude, $\pm\sqrt[2]{2}$ solution curves and their inverse. (Scratch curves.nb)

- $\{t,\frac{t^2}{-2}+\frac{2}{2}\},\{t,\frac{t^2}{+2}-\frac{2}{2}\}$. Main body solution curve ($-red\ and + blue$).
- $\{t,(\frac{t^2}{+2}-\frac{2}{2})^{-1}\},\{t,(\frac{t^2}{-2}+\frac{2}{2})^{-1}\}$. Main body curves inversed. We see three dissociation of main body solution. Main body inverse appears at spin axis. Red $(-)$ inverse at N spin vertex and blue $(+)$ inverse at S spin vertex. Both curves have vertices touching curvature evaluation. I did not construct the discovery curve limits, they are spin vertex tangent, normal with spin axis. The parametric discription will be
- Negative inverse: $\{t,1\}$. This is $(+)$ curvature limit of discovery curve; red body inverse is forbidden contact with rotation plane. Its vertex opens out to positive spin infinity.
- Positive inverse: $\{t,-1\}$ This is $(-)$ curvature limit of discovery curve; blue body inverse is forbidden contact with rotation plane. Its vertex opens out to negative spin infinity.
- We have two spirits for each main body. (+) spirit parts above rotation and negative spirit parts below rotation.

Degree three (index 2) rotation magnitude root of Natural 2-space

$$\text{ParametricPlot}[\{\{\text{Cos}[t],\text{Sin}[t]\},\{t,\frac{t^2}{-4(1)}+1\},\{t,\frac{t^2}{+4(1)}-1\},\{\sqrt[3]{2},t\},\{t,\frac{t^3}{-2}+\frac{2}{2}\},\{t,\frac{t^3}{+2}-\frac{2}{2}\},\{t,(\frac{t^3}{+2}-\frac{2}{2})^{-1}\},\{t,(\frac{t^3}{-2}+\frac{2}{2})^{-1}\}\},\{t,-3\pi,3\pi\},\text{PlotRange}\to\{\{-5,7\},\{-3,7\}\}]$$

Solution curves and their inverse touch discovery curve (N&S) spin vertices. Inversed curves, spirit and main body become asymptote sensitive with rotation and abscissa ID of root $\sqrt[3]{2}$. One root and one abscissa root ID with degree 3 exponents.

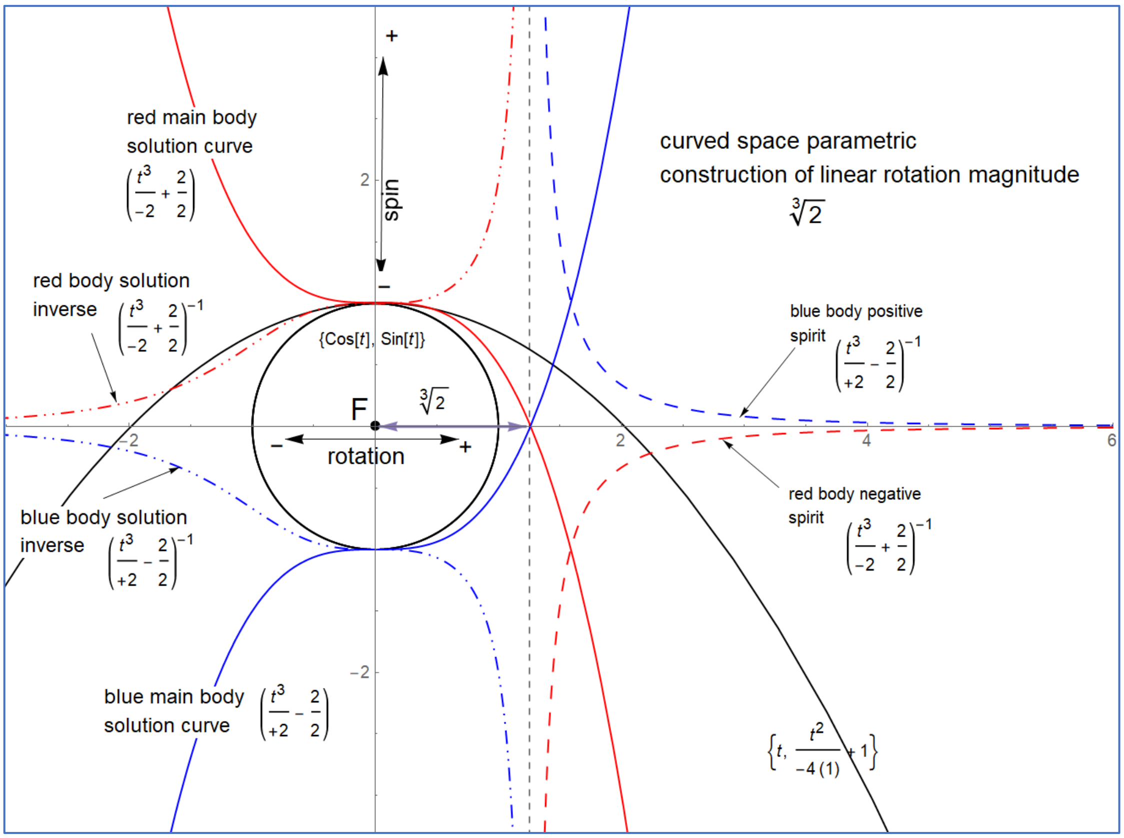

Figure 30: CSDA construction of $\sqrt[3]{2}$ central force rotation magnitude. (space roots.nb)

Index 4

$$\text{ParametricPlot}[\{\{\text{Cos}[t],\text{Sin}[t]\},\{t,\frac{t^2}{-4(1)}+1\},\{t,\frac{t^2}{+4(1)}-1\},\{\sqrt[4]{2},t\},\{t,\frac{t^4}{-2}+\frac{2}{2}\},\{t,\frac{t^4}{+2}-\frac{2}{2}\},\{t,(\frac{t^4}{+2}-\frac{2}{2})^{-1}\},\{t,(\frac{t^4}{-2}+\frac{2}{2})^{-1}\}\},\{t,-\pi,\pi\},\text{PlotRange}\rightarrow\{\{-3,3\},\{\frac{-3}{2},\frac{3}{2}\}\}]$$

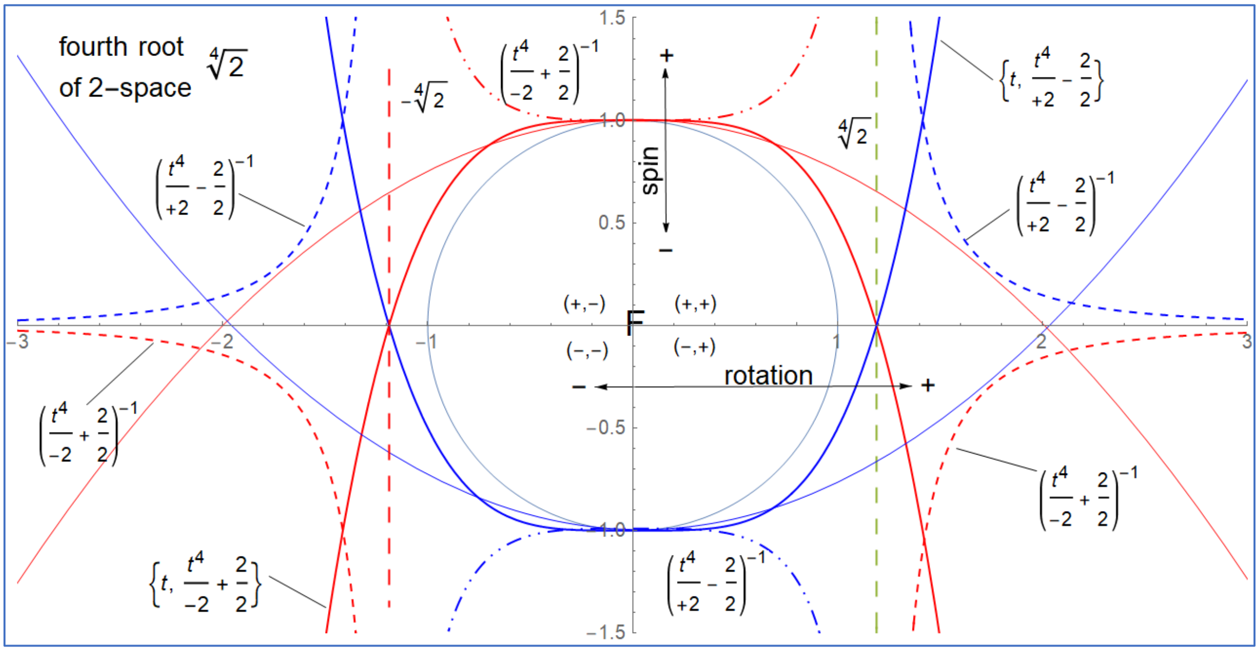

Figure 31: CSDA curved space construction of degree 4 root on central force rotation magnitude. (space roots.nb)

I find no conclusive evidence that time is the 4th dimensional creature we suspect it to be. At least not in our mathematical (exponent) sense. I lay out degree of exponent, as described by Gauss, quantifying a numerical solution for roots.

Degree 1. Linear space. No exponents greater than 1 will return 1 solution.

Degree 2. The first space curve, pretty much explored by Galileo and Calculus of Leibniz and Sir Isaac. No exponents greater than 2 will return 2 solution.

Degree 3. Cubic 3-dimensional space. Up, down, and around. Spin rotation geometry of a **CSDA**. No exponents greater than 3 will return 3 solution.

Degree 4. Just another exponent.

As to time being the 4th dimension, dimension of what? We know time is an operator, a collection of frames, how many how fast? A mouse dancing on a pad? A bullet shearing a playing card length wise?

I say let time operate as a concept member of the word continuum, a complicated concept.

TIME & DEGREE EXPONENT

Degree 1. Sir Isaac's 1st law. A ball bearing set in motion will travel a straight line till stopped by time.

Degree 2. Galileo found that things fall with change of space per unit time dependent on central force G-field acceleration. Terminal velocity tells us how much time to impact.

Degree 3. 3 space motion vectors of Frenet. (v) tangent normal to orbit curve; (a) acceleration force connecting M_2 with M_1. And torque; changing 3-space orbit curves by altering velocity with changing acceleration per unit time.

Degree 4. (?)

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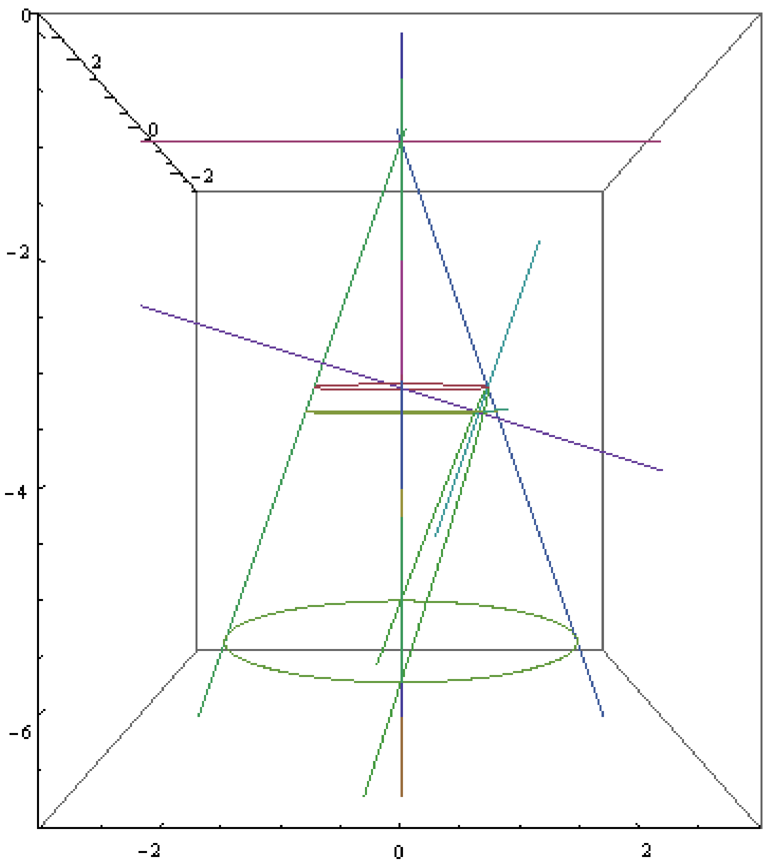
Sand Box Geometry LLC, a company dedicated to utility of Ancient Greek Geometry in pursuing exploration and discovery of Central Force Field Curves.

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.

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alexander@sandboxgeometry.com

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

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.

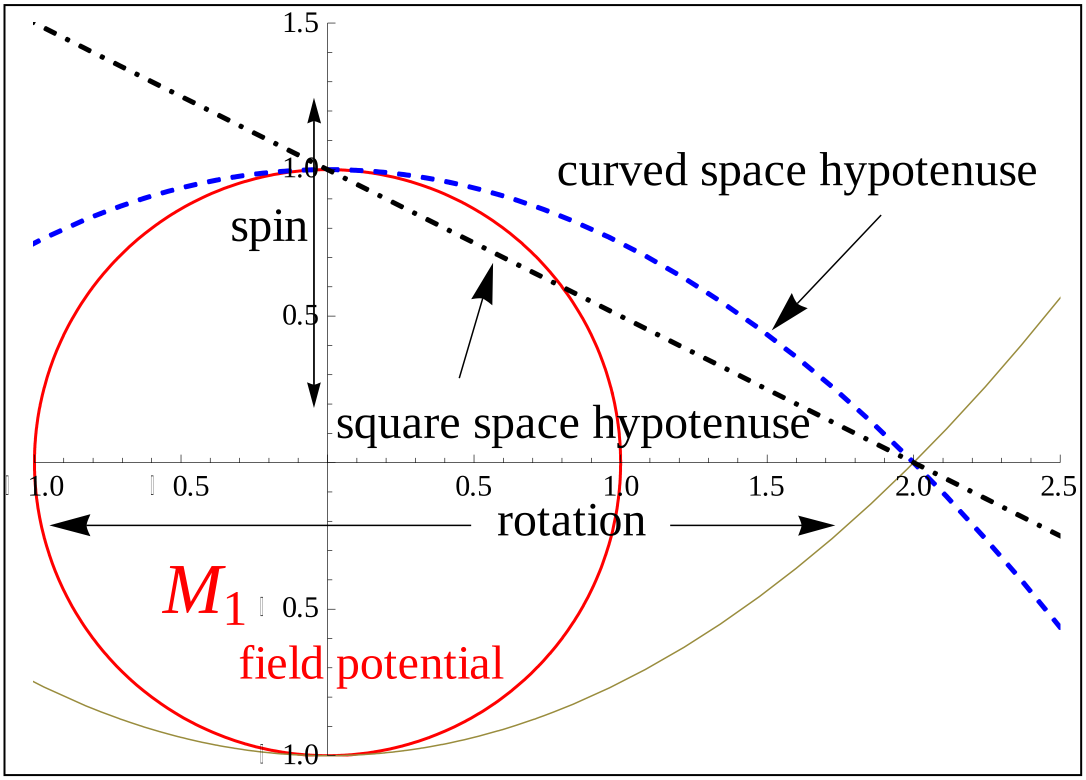

Figure 32: CSDA demonstration of a curved space hypotenuse and a square space hypotenuse together.

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.

ALΣXANDΣR