# Section 4; part 5 (Space Curves of Mars)


### *ABSTRACT*

### *On The Heliocentric Circular Mechanical Energy Curves of Galileo* (32 pages, 3227 words)

Galileo, born 7 years before and dying 12 years after Kepler, was well aware of Kepler's solution concerning complexity about orbit parameters of our brother planet Mars. He refuted till his death, Keplerian elliptical planetary motion as much too complicated a curve. Though a heliocentric advocate as was Kepler, he held that natural curves of an orbit required simplicity and therefore must be circular. This paper explores Galileo's concept of circular heliocentric planetary motion. I develop a standard gravity field $M_1M_2$ model using two plane geometry curves, a unit circle and its construct unit parabola, creating a plane geometry function needed to measure g-field central force energy curves. It turns out that g-field inverse square energy curves are spherical, can be constructed using NASA sourced observation parameters of our planet group and moons, build a standard model space and time square, once constructed provide analytics for orbit momentum around our sun and across the g-field time curve, all within reach of STEM HS math. Both orbit curves, his circles and Kepler's ellipse, can be used to explain gravity field orbit mechanics, I invoke Sir Isaac Newton's inverse square law to confirm Galilean perception.


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Slide 1

Author: Alexander
Pages: 34
Word count: 3500

# JOINT MATH MEETING BALTIMORE MD; 2014

## CIRCULAR ENERGY CURVES OF GALILEO AND GRAVITY FIELD MOTION OF OUR PLANET GROUP

Using

## LINEAR ALGEBRA and PARAMETRIC GEOMETRY

ALEXANDER;

CEO SAND BOX GEOMETRY LLC

Slide 2

# BEGGINING CONCEPTS OF
# CENTRAL FORCE CAUSALITY
# Of
# PLANETARY MOTION
# ARE FOUND, PROVEN, AND ACCEPTED.

JOHANN KEPLER: (Dec. 27, 1571 - Nov. 15, 1630)
Lived 59 years

GALILEO GALILIE: (FEB. 15, 1564 - JAN. 8, 1642)
Lived 78 years Galileo (+11 years)

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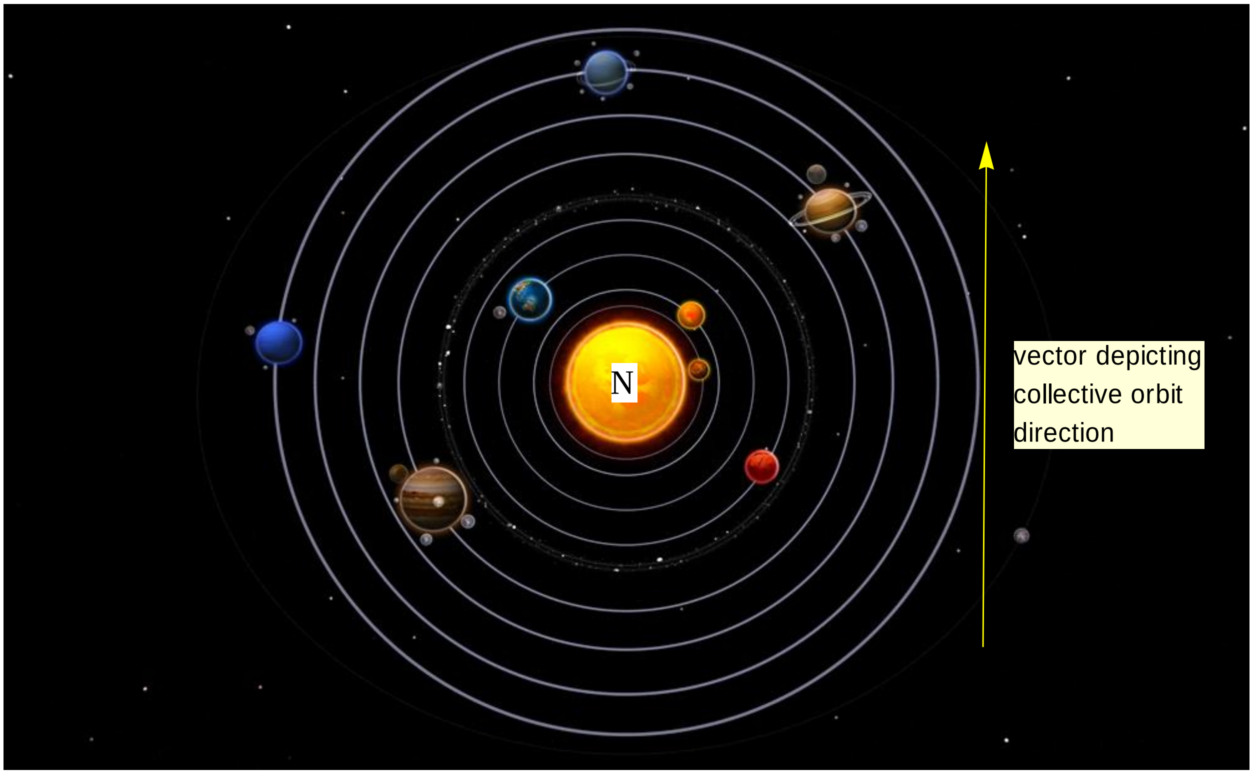
Dialogue

I've always been fascinated by space curves. Allow me to take you back to Galileo and Kepler, to the beginning exploratory of a g-field space curve known as Mars. Galileo and Kepler were contemporaries; Galileo lived 11 years longer than Kepler and was aware of Kepler's solution concerning the enigma the orbit of Mars presented. He refuted Kepler's argument defining the space curve Mars claiming 'the ellipse is much too complicated a curve to be used by God to move His planets; they move in circles'. I will show the perception of Galileo is also correct, maybe more so.

# Slide 3



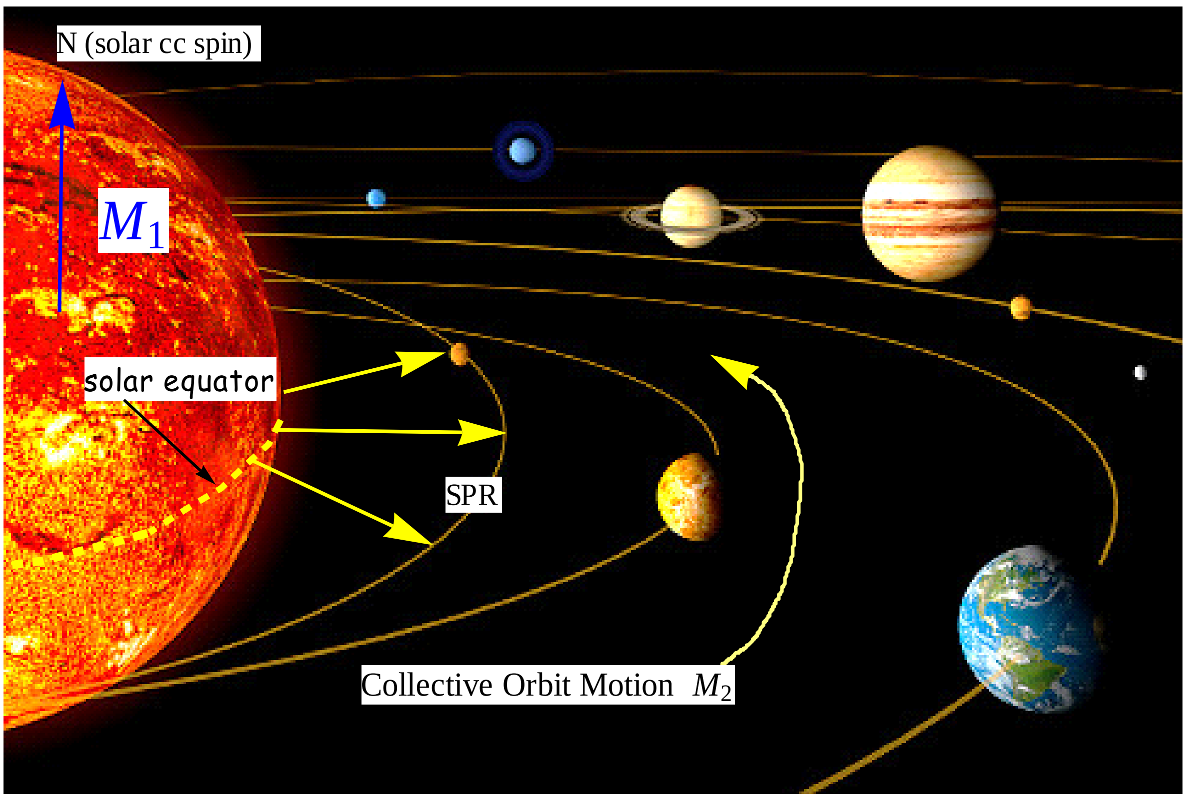

Basic North Pole Solar Spin of our Planet Group. Yellow Vector represents the collective tangential orbit direction of our planet group about our sun.

Dialogue: This is our current popular description of planetary motion, essentially unchanged since Galileo, Kepler, and Newton handed space curve philosophy off to we future generations.

Slide 4

Planet Level Accretion Zone and SPR (Solar Plane of Rotation).

Dialogue: If we are to study the shape of g-field space curves, using planetary geometry, we need another perspective. I start with the solar equator as a plane of rotation holding the planetary accretion diameter of our system, assign the acronym SPR (Spherical Plane of Rotation), and we now view orbit




motion as a function using the solar spin axis (as range) with respect to the plane of the solar equator (as domain). Mercury is the only planet held tightly by the solar equator; the rest of the group enjoys a distributive float on what is called the ecliptic. To find the space curves of Galileo controlling orbit motion, I use a

**CURVED SPACE DIVISION ASSEMBLY (CSDA)**

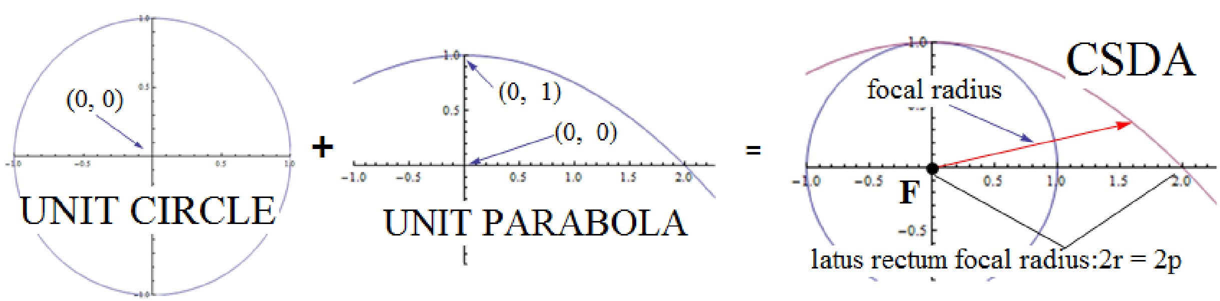
## Slide 5

# WHAT IS A CURVED SPACE DIVISION ASSEMBLY?

```
ParametricPlot[{Cos[t], Sin[t]},
  {t, -π, π},
  PlotRange → {{-1, 5/2}, {-1, 1}}]
```

+

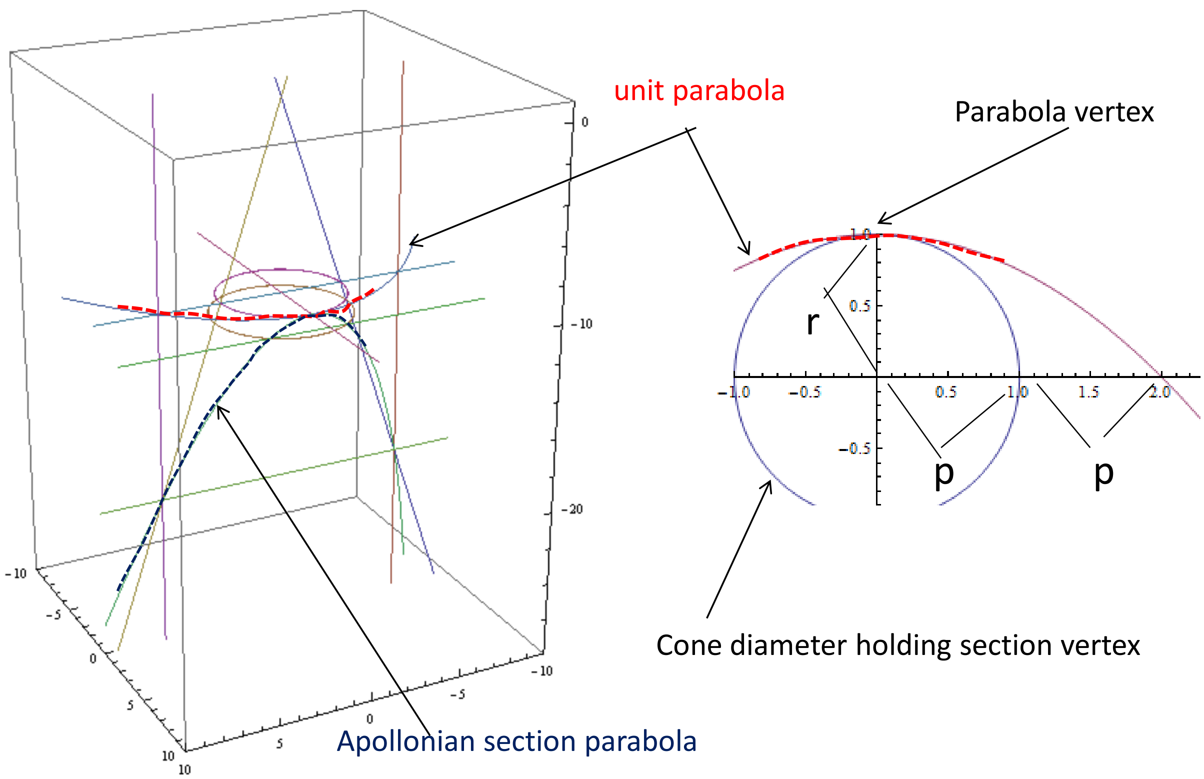
```
ParametricPlot[{{t, t^2/(-4 (1)) + 1}},
  {t, -π, π},
  PlotRange → {{-1, 2}, {-1, 1}}]
```




Dialogue: What is a curved space division assembly? Take the code for a unit circle and add the code for a unit parabola, and you have a curved space division assembly acronym **CSDA.** With central force **F** as center to the construction, we can use the unit circle as independent curve and the unit parabola as dependent curve creating a *plane geometry function* needed to study and explore the curved space geometry of gravity.

## Slide 6: FINDING THE UNIT PARABOLA (UNITS OF (r)).

3

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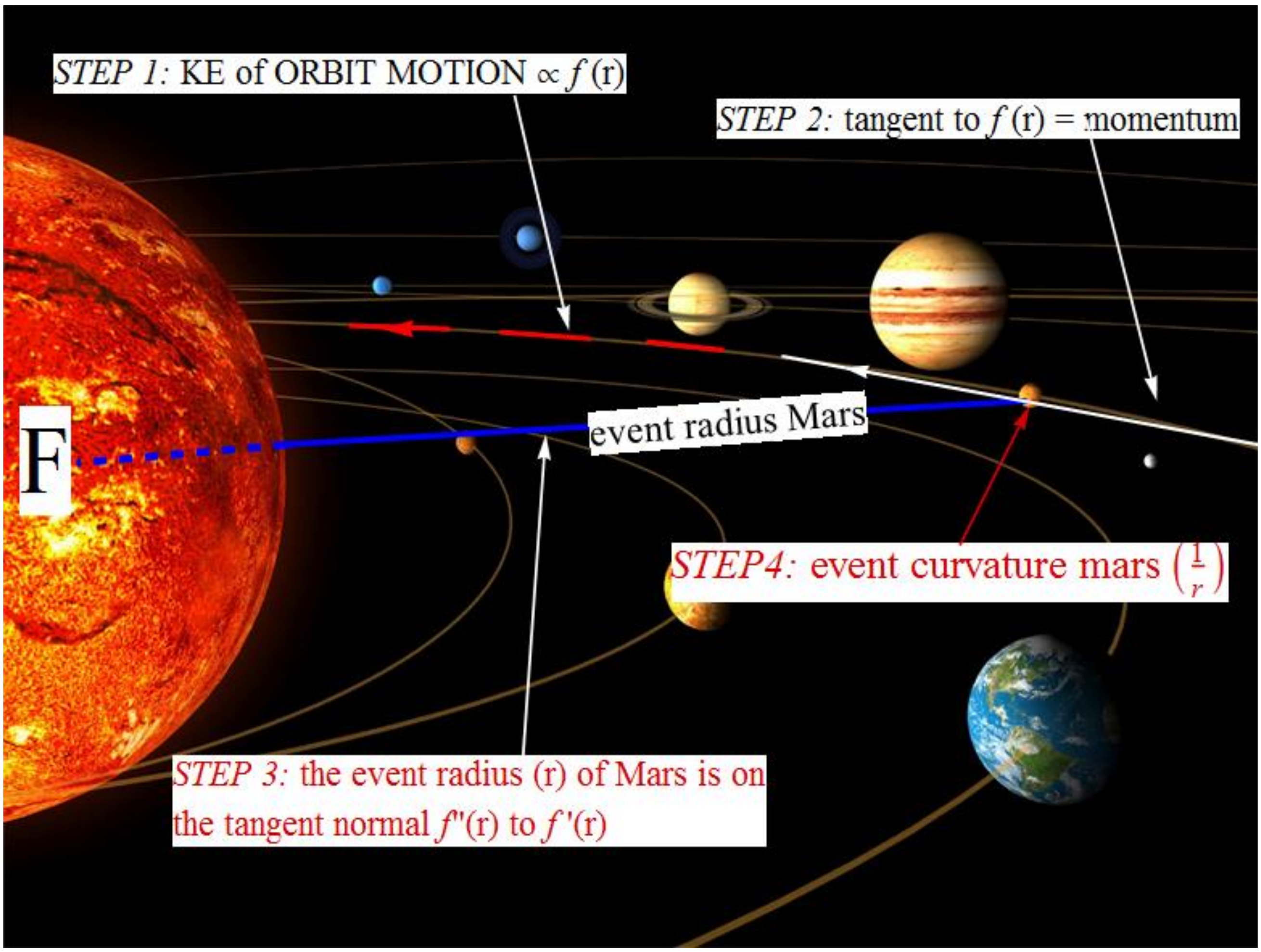
Dialogue: What is a unit parabola? It's an Apollonian section parabola reflected to the plane of the cone diameter where exists a unit circle holding the unit parabola vertex making the diameter (radius) = with unit parabola (p).

## Slide 7

Going from orbit radius of curvature to inverse square event curvature.

$$\left(F_{acc} \propto \left(G \times \frac{M_1 M_2}{r^2}\right) \propto \left(k \times \left(\frac{1}{r}\right)^2\right)^{-1}\right)$$




Slide dialogue continued on page 9.

## Slide 7: Let's consider some HS physics and math.

Step 1: let the changing KE of curved orbit motion be a resultant of $f$ (r), namely Sir Isaac Newton's inverse square law, where (r) is the event radius of the system and varies KE inversely as the square of the central force separation.

Step 2: using a 1st derivative on g-field KE curves brings a straight-line tangent vector charged with tangential velocity and orbit direction.

Step 3: a second derivative operation on a natural orbit curves angular momentum is always normal to the velocity tangent and connects the event radius with the source of orbit accelerations.

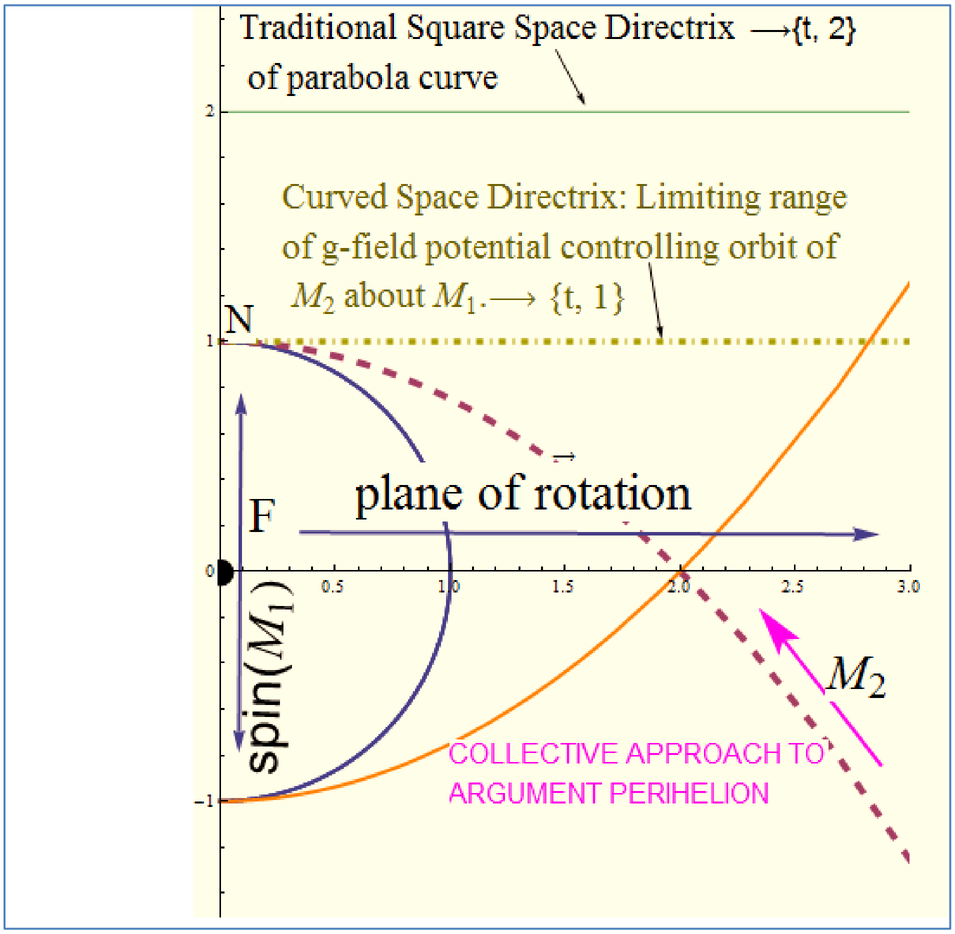
Step 4: we can now find the event curvature of Mars. Though different mathematical terms, curvature and radius of curvature, have equivalence in field mechanics profiling the same motion experience from a different perspective involving one and only one central force focus.

Since M1 and M2 are constant as is (G), roll them into the constant of proportionality. We can now say the motive energy curve shaping planetary motion is proportional to:

$$((event\ curvature\ of\ orbit)^{2} \times (constant\ of\ proportionality))^{-1}$$

Inverse the result to convert curvature terminology into an inverse square meter of orbit energy. I will show the constant of proportionality for our planet group is always the average curve of orbit, which we will find to be the latus rectum diameter of a **CSDA** system.

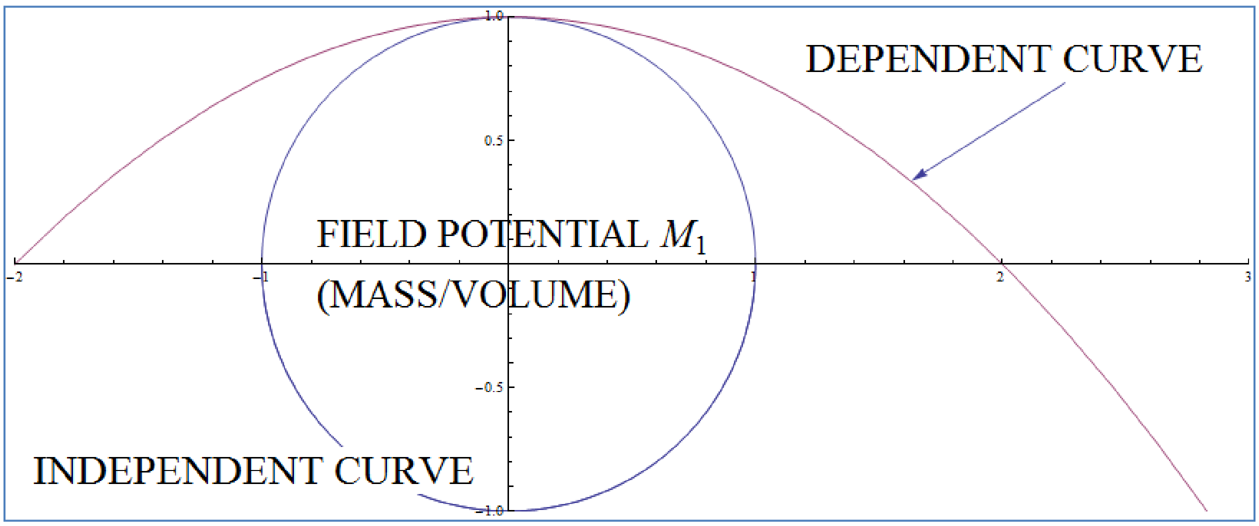
## Slide 8: Construct a basic CSDA:




Dialogue: construct a basic curved space division assembly; I've added the traditional parabola directrix. I have also constructed a *curved space directrix* to be used as limiting range of field potential controlling orbit motion of $M_2$. Our planet group approaches the argument of perihelion in a south to north motion on the north part of a **CSDA** space and time curve.

## Slide 9: ASSIGN FIELD POTENTIAL TO INDEPENDENT CURVE:

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




Dialogue: Step 2: assign the field potential of $M_1$, the field attractor, as the (mass/volume) *content* within the independent UNIT CIRCLE curve.

## Slide 10:

### Step 3: collect square space data for orbit of mars.

basic template for pursuit of standard g-field orbital:

MARS

| central relative position | □ | square space | □ | curved space |
|---|---|---|---|---|
| □ | □ | □ | □ | □ |
| perihelion | □ | 206 620 000 | □ | 1.81305 |
| aphelion | □ | 249 230 000 | □ | 2.18695 |
| average | □ | 227 925 000 | □ | 2 |
| ASI | □ | 113 962 500 | □ | 1 |
| AVERAGE V | □ | □ | □ | 24.13 |
| f ($\pi$) | □ | 20 309 300 | □ | 0.178211 |
| f ($\alpha$) | □ | -22 300 700 | □ | -0.195685 |
| average v | □ | 24.13 | □ | 24.13 |
| focal radius ($\pi$) | □ | 207 615 700 | □ | 1.82179 |
| focal radius ($\alpha$) | □ | 250 225 700 | □ | 2.19569 |

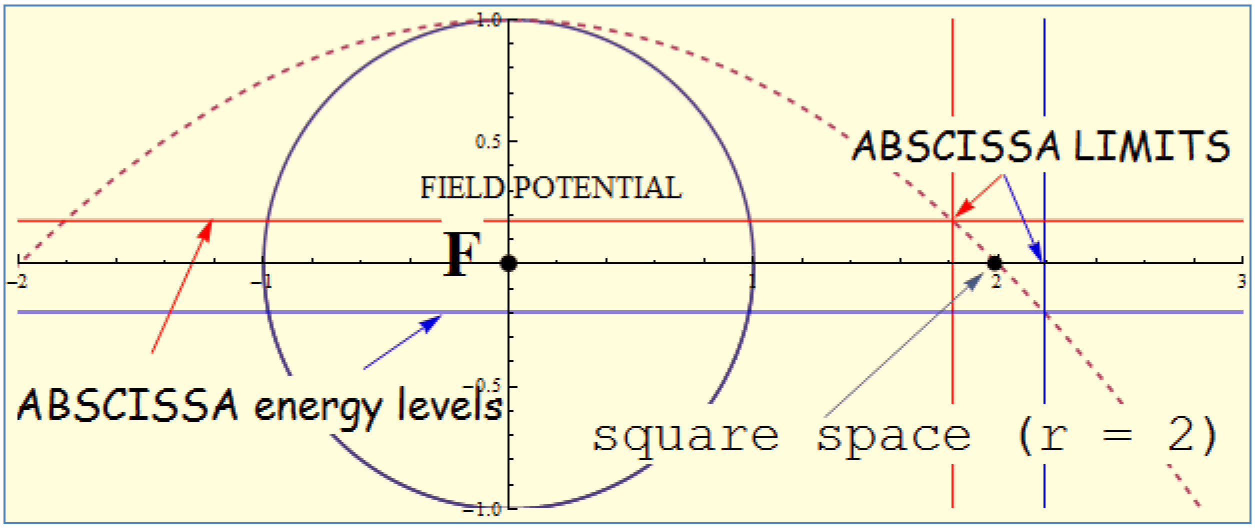
### TO CONSTRUCT MOTIVE ENERGY CURVES OF GALILEO

we need to convert square space kilometric parameters (green column) describing the orbit of mars into unity ratios of a **CSDA** reference frame (orange column). Convert kilometers into **CSDA** unit meter of space and time using the average kilometric radius as denominator of all comparatives. Answers for **CSDA** comparative ratios will be returned when central property kilometer parameters are set as numerators (yellow column). To standardize CSDA g-field comparatives concerning fixed potential, multiply the potential curve by 1(p) and average energy curve by 2(p). Potential belongs to the independent curve:

$$Curvature\ of\ potential\ = \frac{averageradius/_{2}}{averageradius/_{2}} \times 1 = 1$$

## Slide 11

Step 4: construct space and time square centered at average curve of orbit (r = 2); use square space position radius as (abscissa) and energy levels of position radius as (ordinate). High energy perihelion is red; low energy aphelion is blue.




**Establish Mathematica template for energy level :**

$$\frac{t^2}{-4} + 1 \ /. \ t \to 1.8131 \to 0.1782$$

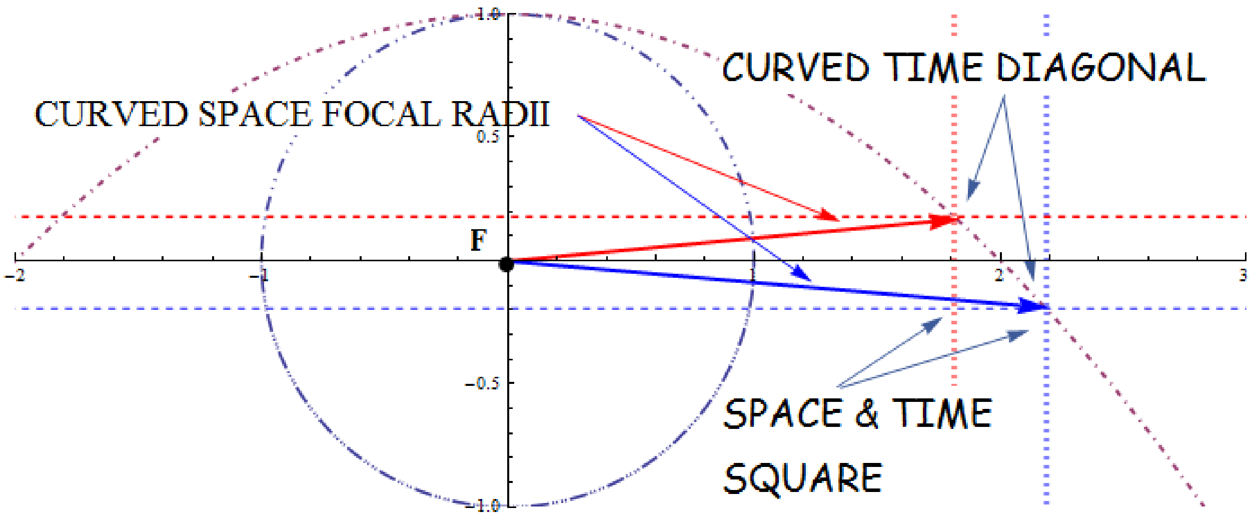
$$\frac{t^2}{-4} + 1 \ /. \ t \to 2.1870 \to (-0.1957)$$

Dialogue continued on page 14:

## Slide 11:

SPACE TIME SQUARE: construct space and time square centered on radius 2 of the average curve of orbit. Use orbit limits for (abscissa) sides and energy levels of orbit limits for (ordinate) sides. High energy perihelion is red; low energy aphelion is blue. To find energy levels, use a *Mathematica* template. Take the dependent curve as template base and set **CSDA** central property position parameters as (t) to return energy levels.

## Slide 12; STEP5: CONSTRUCT LINEAR FOCAL PROPERTIES TO ORBIT SPACE AND TIME SQUARE LIMITS: $(slope = (f(r))/r)$




Solve$\left[y - 0.1782 == \frac{0.1782}{(1.8131)}(x - (1.8131)), y\right] \rightarrow \{y \rightarrow 0.1782 + 0.0983\,(-1.8131 + t)\}$

Solve$\left[y - (-0.1957) == \frac{(-0.1957)}{(2.1870)}(x - (2.1870)), y\right] \rightarrow \{y \rightarrow -0.1957 - 0.0895\,(-2.187 + t)\}$

2 - 0.1782 = 1.8218 ⟶ focal property r = 1.8218; central property inverse square r = 1.8131

2 - (-0.1957) = 2.1957 ⟶focal property r = 2.1957; central property inverse square r = 2.1870

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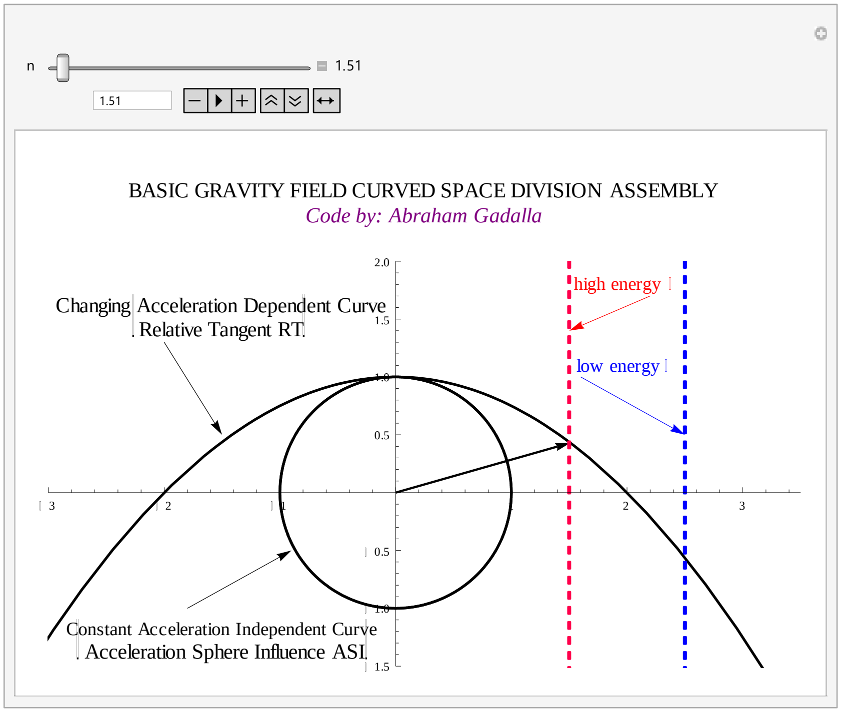
Dialogue: Step 5: Construct curved space focal radii to space and time square corner limits, using point slope linear equation. Slope parameter for point slope form = $\frac{energy\ level}{\text{event radius}}$. We need focal radii magnitude and slope to construct energy and insulator tangents arranging gravity field curves of Galileo.

Notice difference in focal magnitude and traditional central property radius.

Slide 13: A COMPUTER DOCUMENT FORMAT DEMONSTRATING CHANGING ORBIT ENERGY (*f* (r)) FOLLOWING SQUARE SPACE RADIUS (r). (code by Abraham)




Dialogue: We can now see a **CDF** description using the focal radius to follow changing orbit energy *f*(r) of $M_2$ accompanying square space central property position radius (r). (OPEN SLIDER CONTROL, SET ORBIT MOTION AS BACKWARD AND FORWARD, SLOW AS NEEDED TO SEE PERIOD MOTION WITH RESPECT TO ENERGY) As focal radii reach the high energy limit perihelion they fall back to the low energy limit aphelion. Each cycle is 1 period long, and requires a congruent meeting of focal radii energy (*f* (r)) of curved space following central property radius (r) of square space happening on the average energy diameter when event slope is (–1).

CODE BY ABRAHAM GADALLA,
WOLFRAM EMONSTRATION PROJECT CONTRIBUTOR

May 16 CDF CSDA.nb

Dynamic math no longer operates (Oct. 2019)

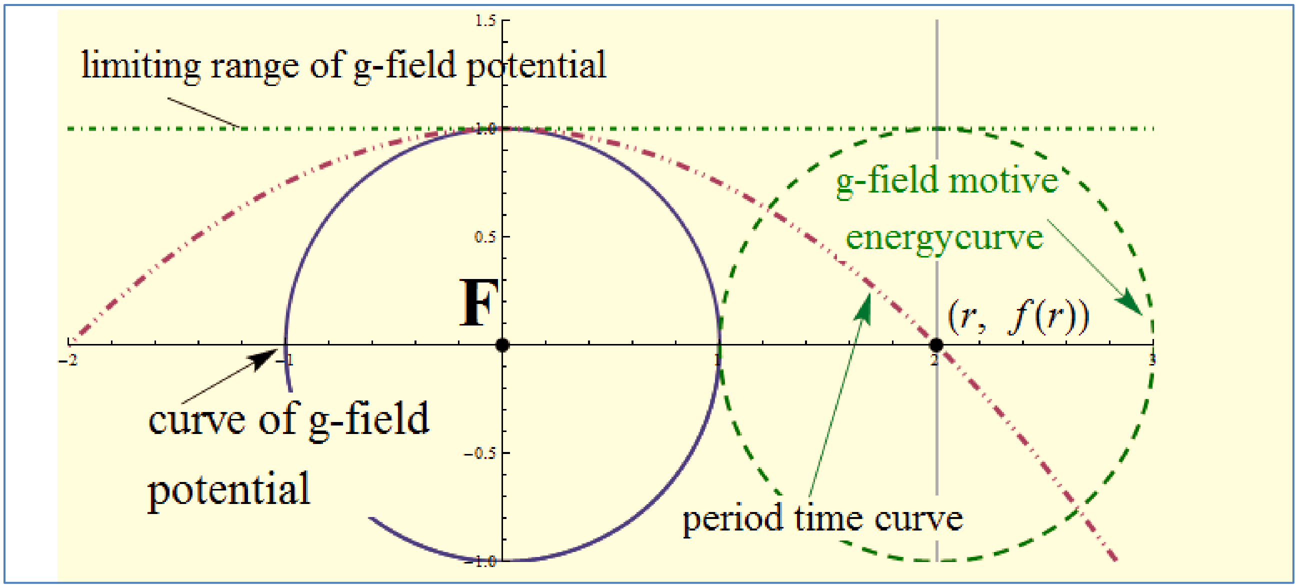
Slide 14

## Unity curves of Galileo; curvature *and* radius of curvature = 1.

PROPOSAL: LET THERE BE TWO CURVES COMPOSING (a zero-sum philosophy) ABOUT ORBIT ENERGY EXCHANGE BETWEEN POTENTIAL AND MOTION ($M_1 \leftrightarrow M_2$):

1ST CURVE IS POTENTIAL: (a FIXED, CLOSED unity curve centered about **F**). (Curvature and radius of curvature = 1)

2ND CURVE IS INVERSE SQUARE MOTIVE PROPERTIES OF POTENTIAL, ORBIT MOMENTUM centered as (r, *f* (r)) on CSDA latus rectum focal radius.




Since energy exchanged between these two curves determines orbit momentum, we need two equal curves to *initialize* and quantify available energy to share; when added together zero balance the exchange for stable orbit motion. Somewhere, on the period time curve, there will be a motive curve of same shape as potential less the (mass/volume) content. Enter the latus rectum average orbit diameter, reference level of gravity field orbit energy curves. It is here, and only here, on the average diameter of an orbit can two unity curves co-exist.

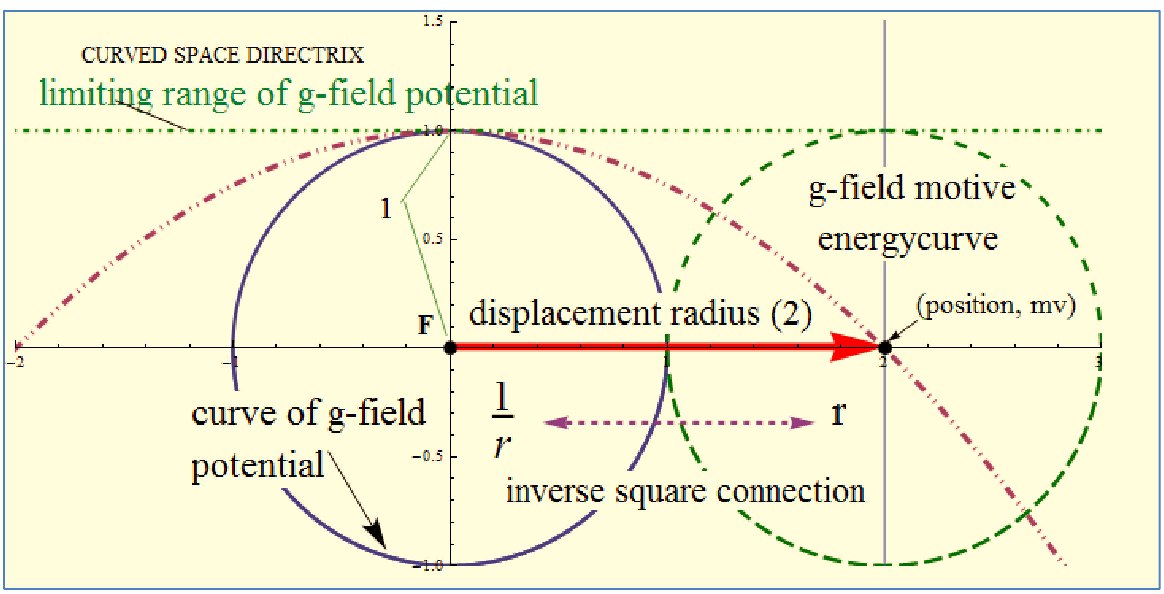
Slide 15:

Theorem (On the Potential and Motive Curves of Galileo)

1). Conserved sum of available energy for system motion is stored on CSDA Latus Rectum Diameter. When central force potential curvature =1, and focal radius motive curvature =1; then CSDA Square Space Radius 2 will balance, center to center, 2 unity curves (curvature and RoC =1). First curve is about F as center of potential and second curve is center of motive event at (slope m = -1) of energy tangent happening (where?) on CSDA period time curve (when?) at dependent curve latus rectum rotating diameter.

2). Motive curve + energy level (*f* (r)) = potential curve.

3). Potential curve - (Motive curve + energy level (*f* (r))) = zero



## Slide 15 Dialogue:

Notice the inverse square connector. I have two methods to compute the resultant radius of a motive energy curve shaped by potential. The first is a simple subtraction of field potential radius (1) deducted from the curved space focal radius (r, *f*(r)). The second is Sir Isaac Newton's Inverse Square Law.

# Slide 16

## Prove shape of average motive curve = shape of potential curve

1. Construct range of potential as a tangent limit through orbit space.

2. Construct shape of potential curve (curvature = 1) about center **F**; given.

3. Compute and construct shape of motive curve at event slope (m = -1), using

a) Focal property differential;

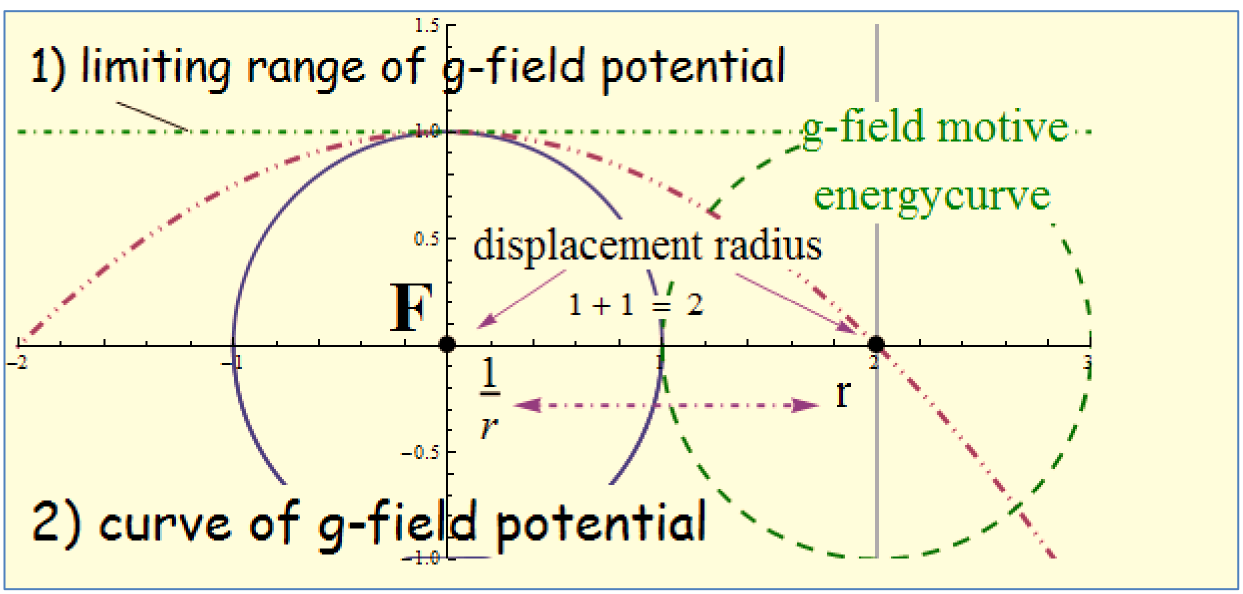
b) Sir Isaac Newton inverse square law.

a) Radius of motive curve = (focal radius mag - potential) → (2 - 1 = 1)

b) Radius of motive curve using inverse square law where initial parabola focal radius p = r = 1 making average energy diameter (4p) *and* event radius = 2.

$$\left[\left(\left(\frac{1}{2}\right)^2 \times (4p)\right)^{-1} = 1\right]$$

QED: [Proof that latus rectum diameter is constant of proportionality in a CSDA]



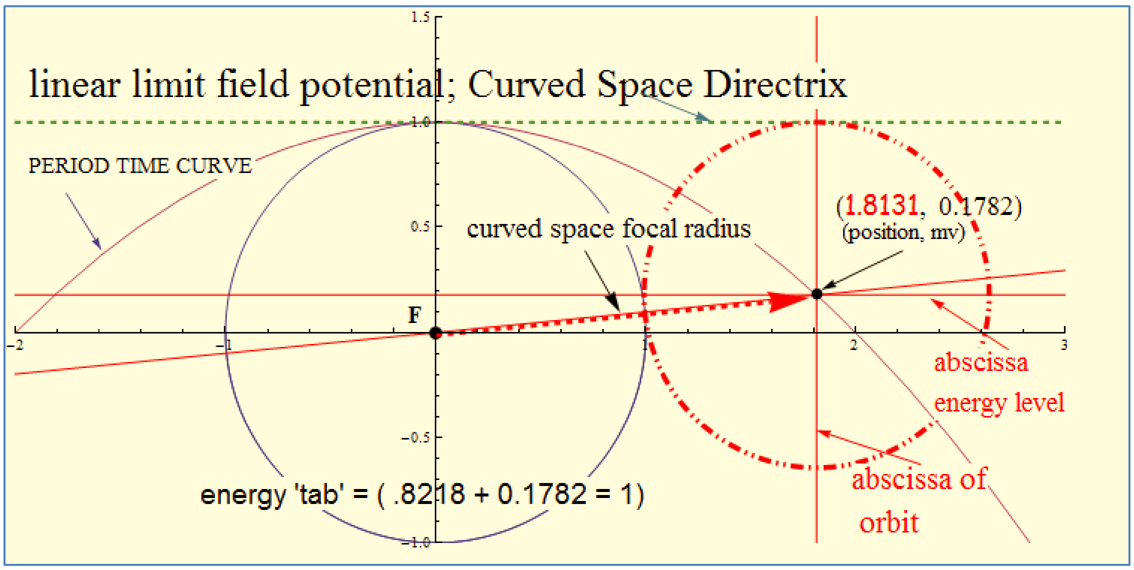
# Slide 17

CONSTRUCT HIGH ENERGY MOTIVE CURVE OF MARS

All **CSDA** motive curve radii = (focal radius magnitude - field potential)

Focal radius magnitude = (2p -*f* (r)) → (2 - 0.1782 = 1.8218); 1.8218 - 1 →

radius of motive curve = (0.8218)




$$\left(\left(\frac{1}{1.8131}\right)^2 * (4)\right)^{-1} \rightarrow (0.821833) = \text{shaping radius of motive energy}$$

Slide 17:

Dialogues: CONSTRUCT HIGH ENERGY MOTIVE CURVE OF FIELD. If motive properties of a planet vary as the inverse square of distance, we must subtract field potential part from a curved space focal radius to determine shape of curved space motive energy part. Since all motive parameters are subservient to potential; acting motive curve will:

Maintain contact with limiting range of field potential (g-field curved space directrix), and

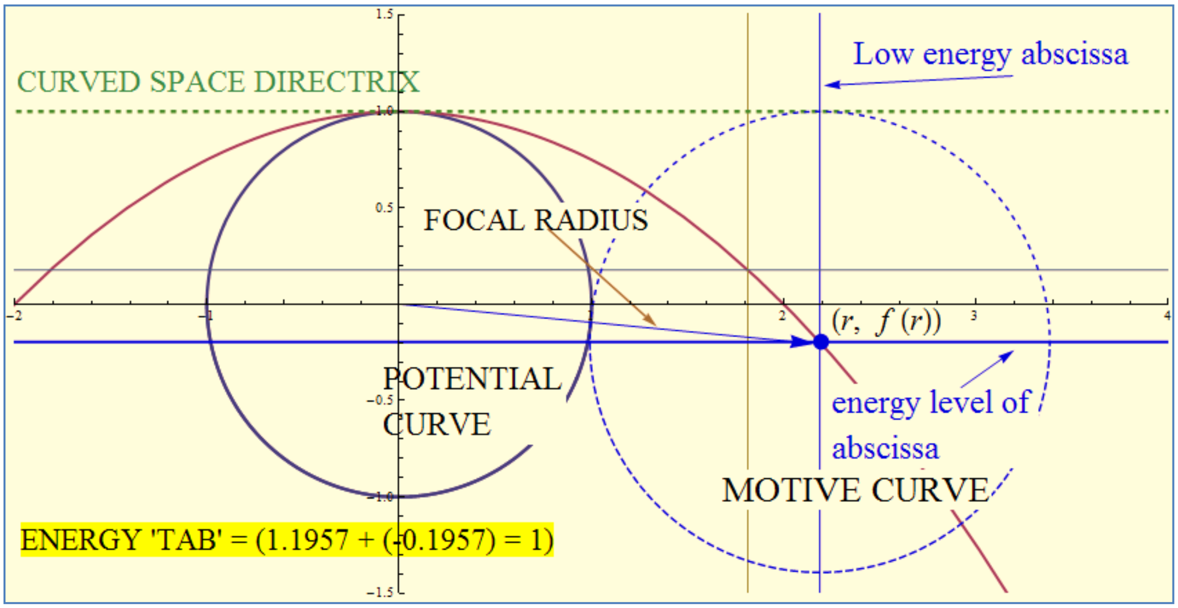
Maintain contact with surface acceleration curve of potential (in a similar way as we are captured by surface acceleration curve of our earth).

Once we have radius of motive curve, place motive Cartesian center, ($r$, $f(r)$), on **CSDA** orbit period time curve.

# Slide 18;

CONSTRUCT LOW ENERGY MOTIVE CURVE OF MARS⟶ (2.1870, - 0.1957)

{1.1957Cos[t]+2.1870, 1.1957Sin[t]-0.1957}




2.1870 is event radius, ME of event radius : -0.1957

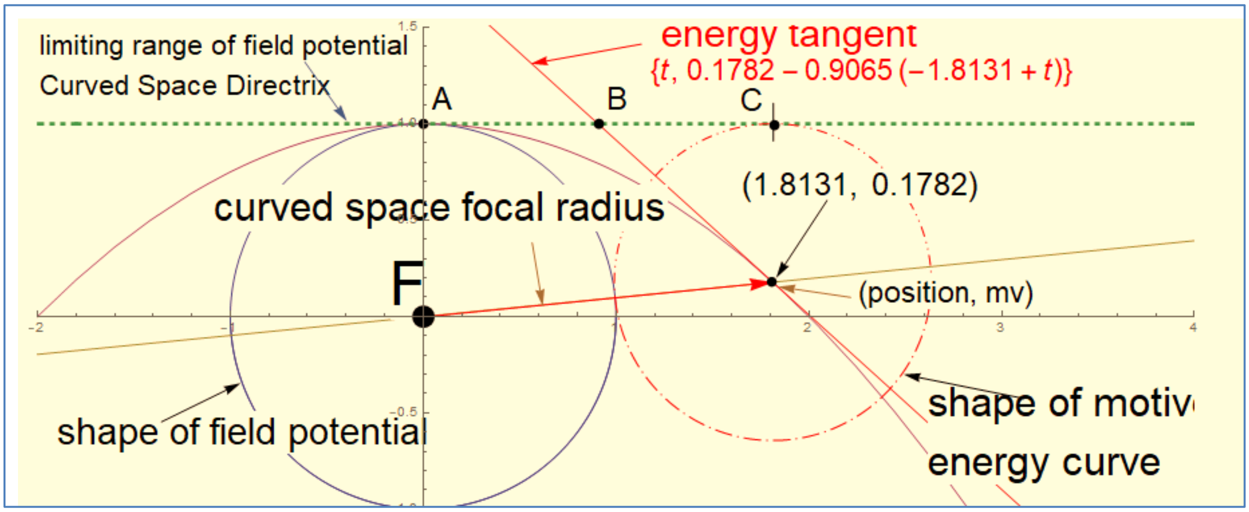
2 p - f (r) - potential = motive curve radius; $(2-(-0.1957)-1=1.1957)$

$$\left(\left(\frac{1}{2.187}\right)^2 \times 4(1)\right)^{-1} \rightarrow 1.1957 = \text{shaping radius of motive energy.}$$

## Slide 19: Construct High Energy Event Tangent Following Orbit Motion for Planet Mars on CSDA time curve.

$$Solve[y - 0.1782 == \left(\frac{-1.8131}{2}\right)(x - 1.8131), y] \rightarrow$$

$$\{\{y \rightarrow 0.1782 - 0.9065(-1.8131 + t)\}\}$$




Energy Tangent Slope is found using first derivative of dependent curve.

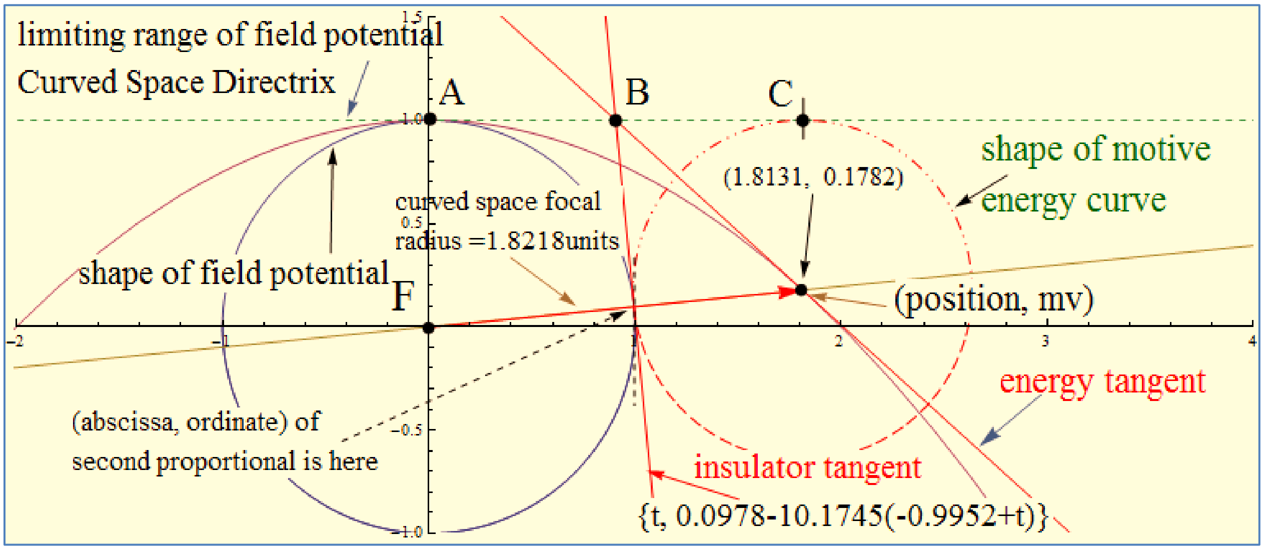
$$\left(\begin{pmatrix} 1st\ derivative\ as\ slope\ term;\ using \\ central\ prop\ (r) as\ variable\ (t) \end{pmatrix} * (x - central\ property\ (r))\right)$$

$$\partial_t\left(\frac{t^2}{-4(p)} + r\right) \rightarrow -\frac{t}{2p} \rightarrow \left(\frac{-1.8131}{2}\right)$$

Will return energy tangent parameters.

## Slide 20:

### Construct High Energy Insulator Tangent separating opposing forces of attraction and escape.




Compute **abscissa** of insulator tangent:

$$Solve\left[\frac{1}{x} == \frac{1.8218}{1.8131}, x\right] \to \{\{x \to 0.9952\}\}$$

Compute **ordinate** of insulator tangent:

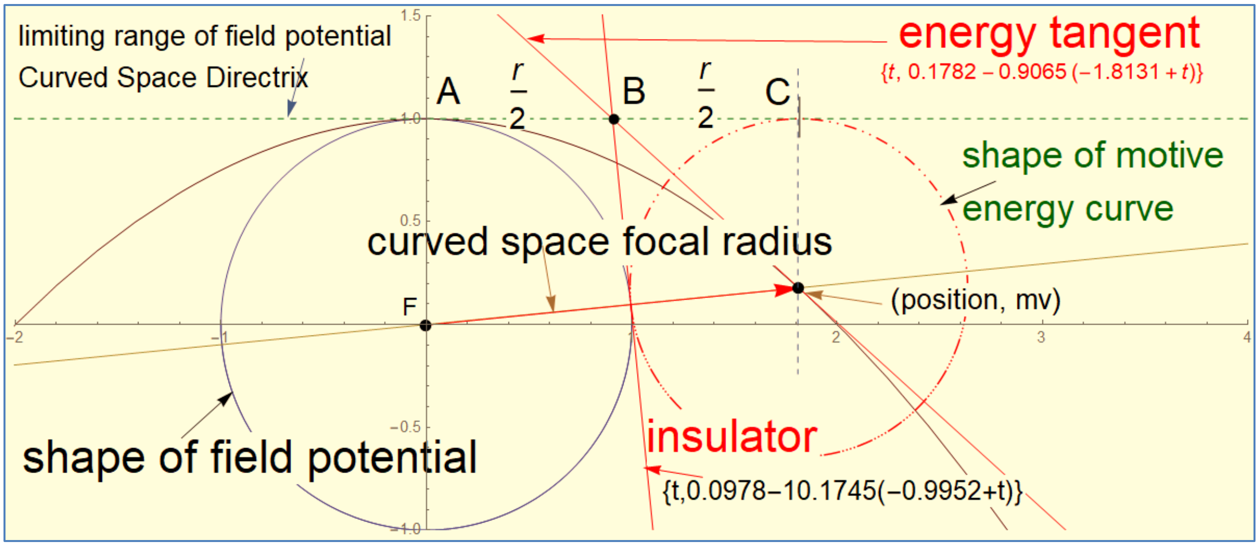
$$Solve\left[\frac{1}{x} == \frac{1.8218}{0.1782}, x\right] \to \{\{x \to 0.0978\}\}$$

Construct High Energy Insulator Tangent separating opposing forces of attraction and escape. (Slope of insulator is normal with focal radius). To find (abscissa, ordinate) needed for point slope parametric definition, use right triangle direct proportion with unknown as second proportional and curvature of potential (= 1) as the first proportional. Proportional 3 and 4 operate using event focal radius as hypotenuse numerator and (r, $f$ (r)) as alternate denominator, r⟶ for abscissa and $f$ (r)⟶ for ordinate.

Slide 21

## CONVERGENCE POINT OF MOTION ENERGY

All energy tangent phenomena (motive and insulator) connect at curved space directrix at point B (central property radius/2).




Slide 21

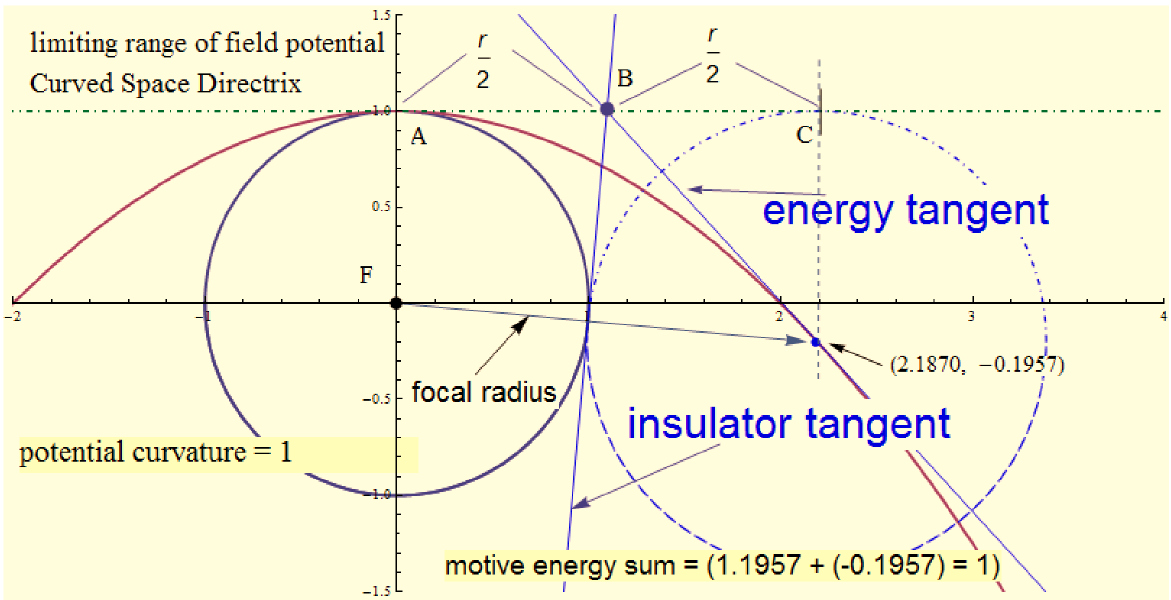
## Dialogue: CONVERGENCE POINT OF MOTION ENERGY TANGENTS

both tangent phenomena (motive and insulator) meet on the field curved space directrix at point B, (median of all square space event radii), demonstrating potential control of field motion as conservation law of angular momentum. (How do we get there?)

Linear energy distribution on curved space directrix seems to indicate shared equality showing half to potential, and half to motion. But this is a sourced zero-sum distribution property, as such, linear distribution geometry (shaping both curves) is equal once and only once, happening on the average energy diameter. Motive energy curves change shape to accommodate conserved angular momentum experienced by changing orbit radii. Change of shape splits distribution on curved space directrix, ½ to potential and ½ to motion

# Slide 22 Construct Low Energy Orbit Tangents (Mars)

ENERGY TAB: motive energy sum = (1.1957;motive radius + (-0.1957; *f*(r)) = 1)




$$Solve[-0.0891 + 11.1753(-0.996 + t) == -0.1957 - 1.0935(-2.187 + t), t] \rightarrow 1.0935$$

$$\frac{2.187}{2} \longrightarrow 1.0935$$

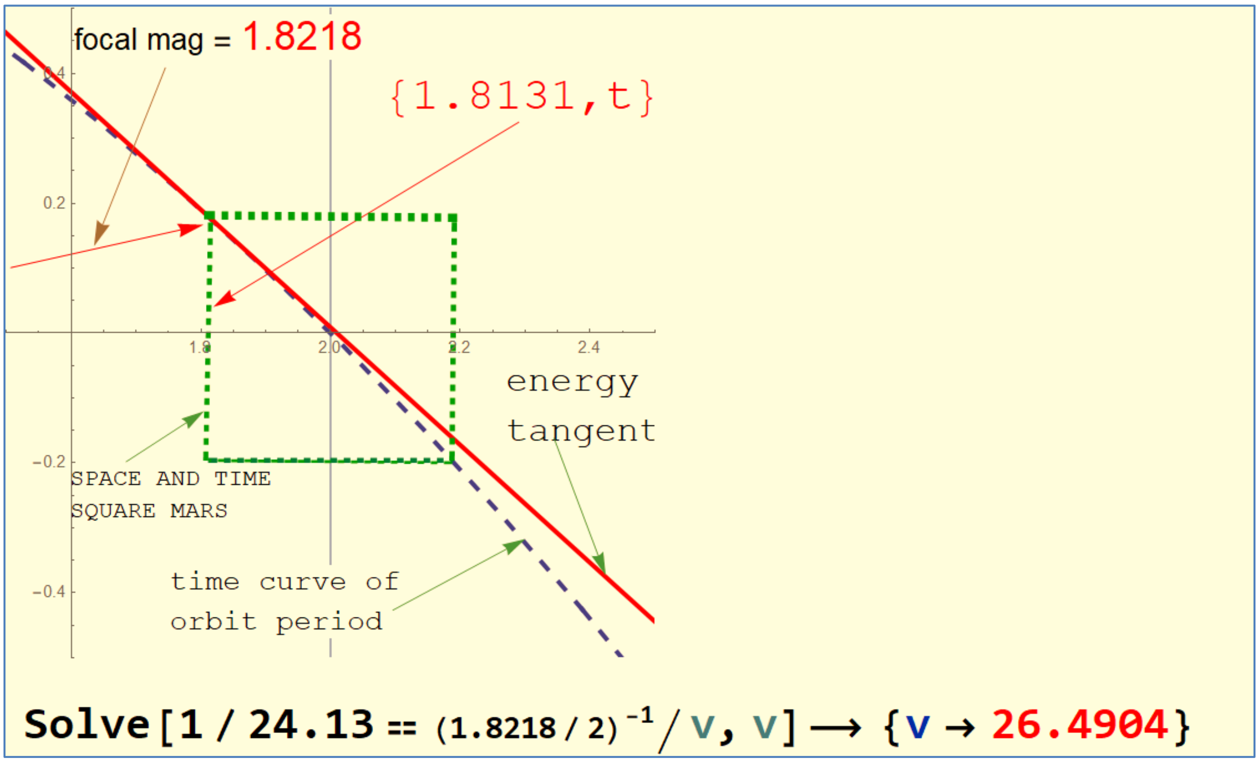
## Dialogue: Construct both Low Energy Orbit Tangents

Same procedures apply. I demonstrate energy 'tab' for motive curve to show equivalence with potential for zero sum balanced orbit motion on the curved space directrix. Set tangents equal to each other and Intersection of tangents = 1.0935 on the curved space directrix; central radius of aphelion/2 will also = 1.0935.

Slide 23

## Finding max period momentum using space and time square event slope.

{Mean orbital velocity, ⟶ 24.13}
{Maximum orbital velocity, ⟶ 26.50}




$$Solve[\frac{1}{24.13} == \frac{(1.8218\ /\ 2)^{-1}}{v}, v] \longrightarrow \{v \rightarrow 26.4904\}$$

Using focal radii to track historical curvature of orbit motion is to follow changing **KE** slope moving *along* the period time curve. To determine orbit momentum at specific curves of the period requires placement of tangential velocity vector *across* the time curve slope. A system tangent normal into the paper.

The normal of the first derivative energy tangents slope is into the paper and across the time curve, giving us a read of tangential velocity of an energy curve angular momentum. When we substitute a focal radius magnitude instead of inverse square radii as the variable for the 3rd proportional first derivative slope, we find an accurate velocity vector across the time curve.

$$\frac{slope(1) of\ time\ curve}{energy@(m=1)} = \frac{\left(\frac{focalr}{2}\right)^{-1}}{v}$$

Momentum at perihelion is a direct proportional: Event slope 1 of average energy tangent is first proportional and v for (mars is 24.13 KM/SEC) at slope 1 event is 2nd proportional = to: 3rd proportional is the first derivative of dependent curve using focal property magnitude as variable, change sign, invert, and solve for momentum as 4th proportional.

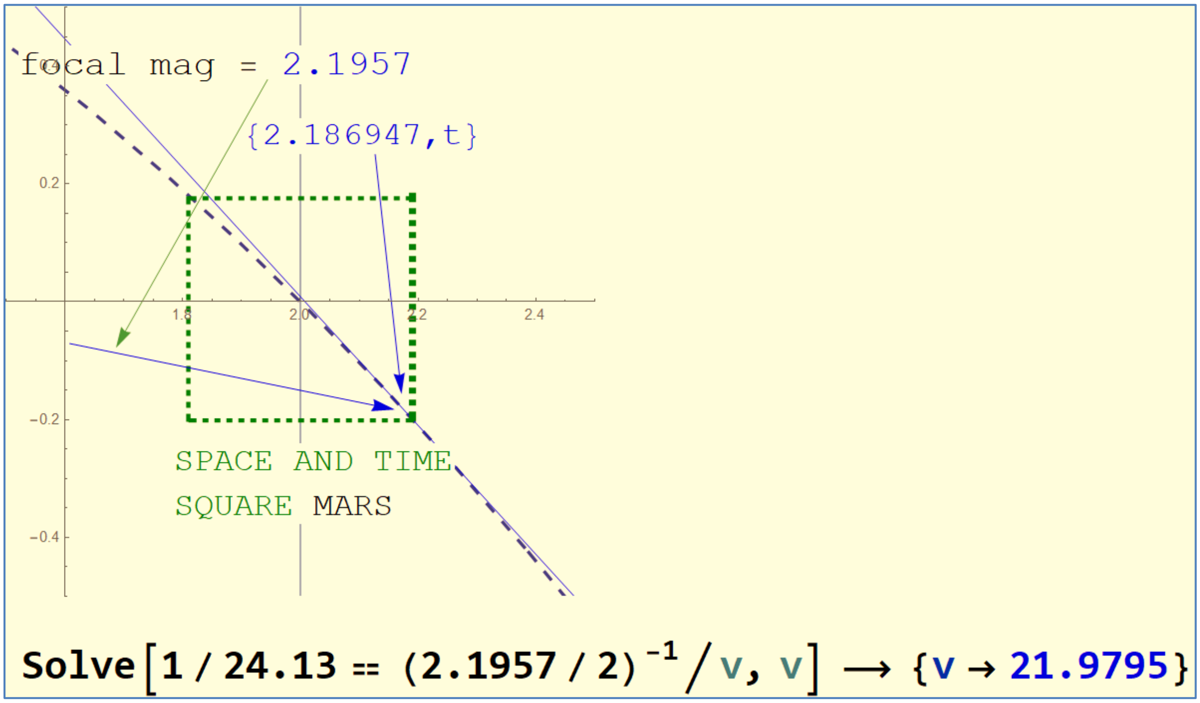
Euclidean plane geometry will return 26.4904 KM/SEC for perihelion momentum on max energy curve for planet Mars.

## Slide 24

Finding min period momentum using space and time square event slope

{Mean orbital velocity, → 24.13}

{Min. orbital velocity, → 21.97}




$$\text{Solve}[1/24.13 == (2.1957/2)^{-1}/v, v] \longrightarrow \{v \to 21.9795\}$$

## Slide 24: Same for v of aphelion.

Slope 1 event as 1st proportional, event momentum as 2nd proportional will equal the first derivative of dependent curve as 3rd proportional and solve for (v) as 4th proportional.

Euclidean plane geometry will return 21.9795 KM/SEC for aphelion momentum on minimum energy curve for planet Mars.

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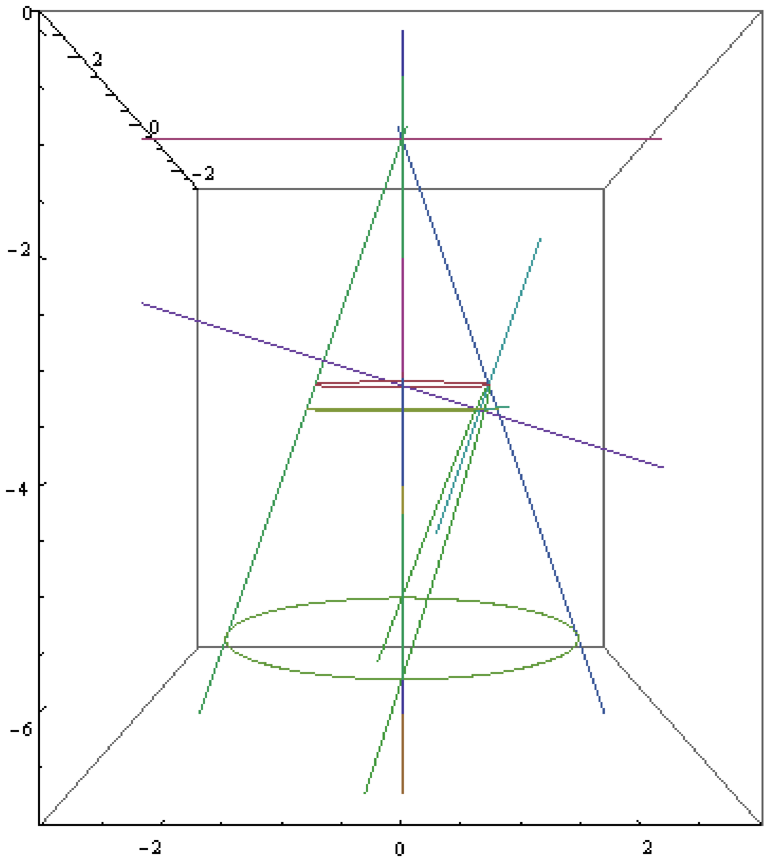
Sand Box Geometry LLC, a company dedicated to utility of Ancient Greek Geometry in pursuing exploration and discovery of Central Force Field Curves.

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



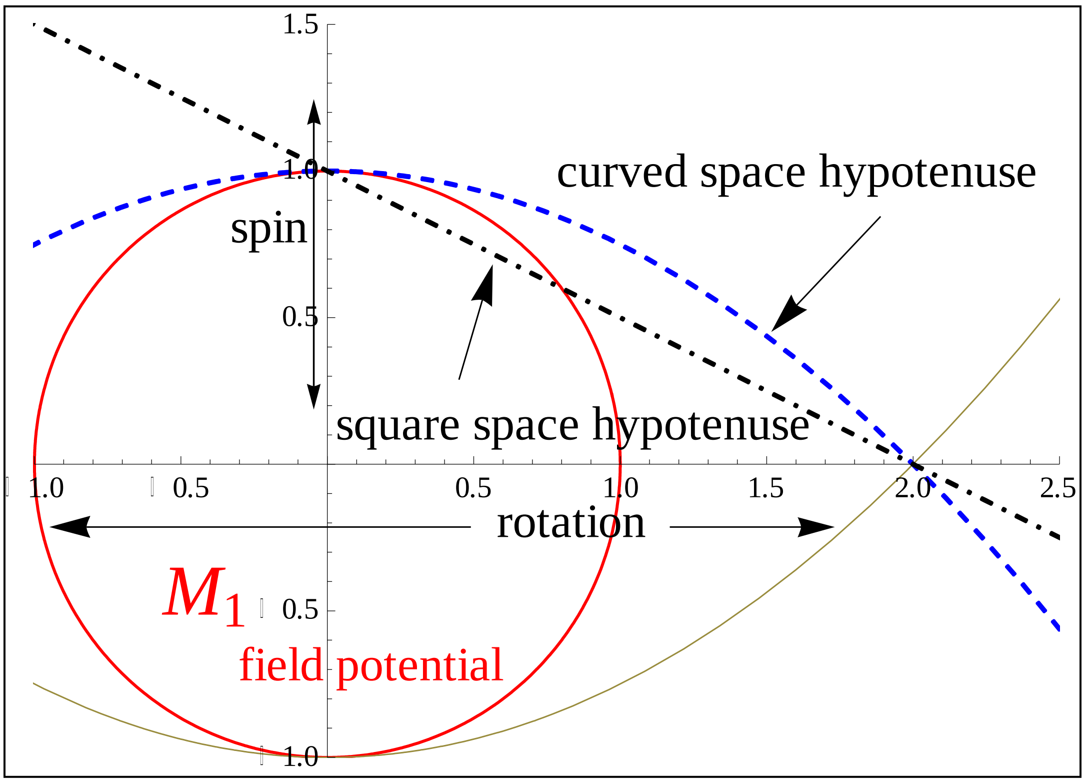

"It is remarkable that the directrix does not appear at all in Apollonius great treatise on conics. The focal properties of the central conics are given by Apollonius, but the foci are obtained in a different way, without any reference to the directrix; the focus of the parabola does not appear at all... 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

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 mechanical energy curves.




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; CEO SAND BOX GEOMETRY LLC