In what way was Newton able to conclude that the force responsible to orbit the Moon around the Earth is same as the force which causes an Apple to fall on the surface of the Earth?

Michael Brenner
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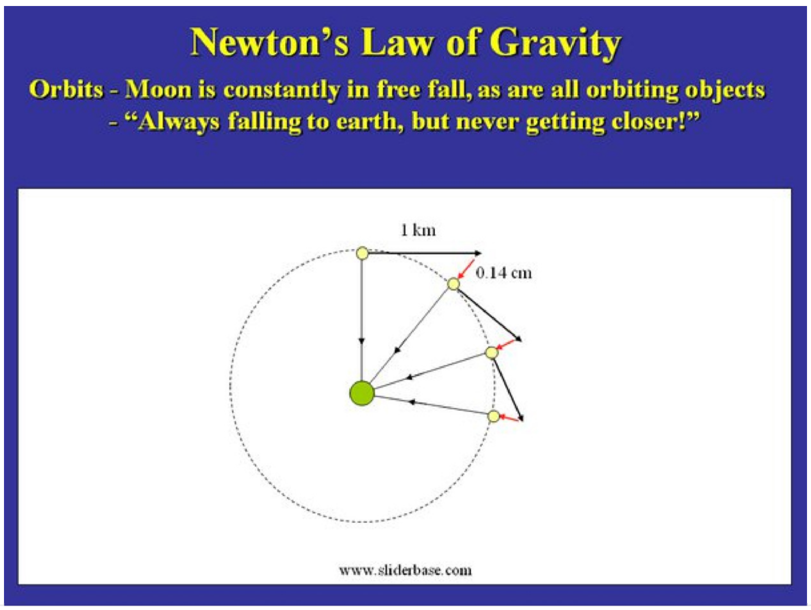
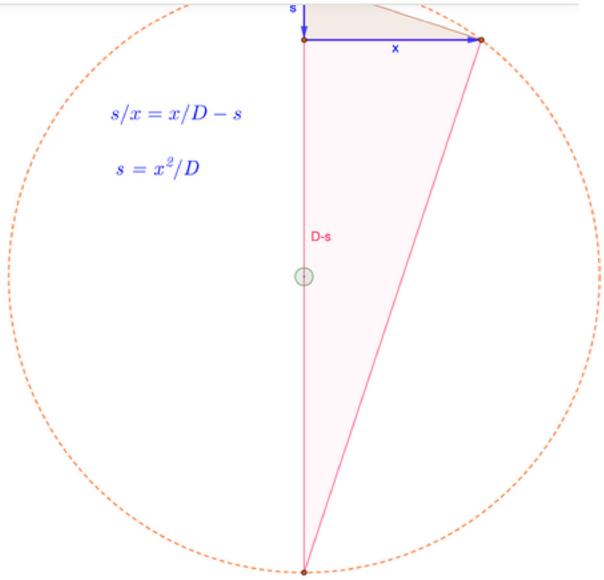
I have written half a dozen or so answers circling around that topic lately, but hundreds of comments, some well intended and long winded show that there cannot enough light be cast on the intricacies of the matter, as it is the foundation of what we call *"modern science"* and errors here will cascade through the entire model built upon it: *"Once the error is based like a foundation stone in the ground, everything is built thereupon, never it returns to light" (Clausius)*

Contrary to school book lore, Newton did not take a dynamic approach, that is, an approach that treats the moon for instance as a moving body as seen in the contemporary interpretation here below:



traingles": here [s] and [x] are distances, not velocities and accelerations, as Newton freezes everything into "one second": 10m/s for instance become 10m if you only consider the time interval of 1s, 5m/s^2 become 5m for t=1.

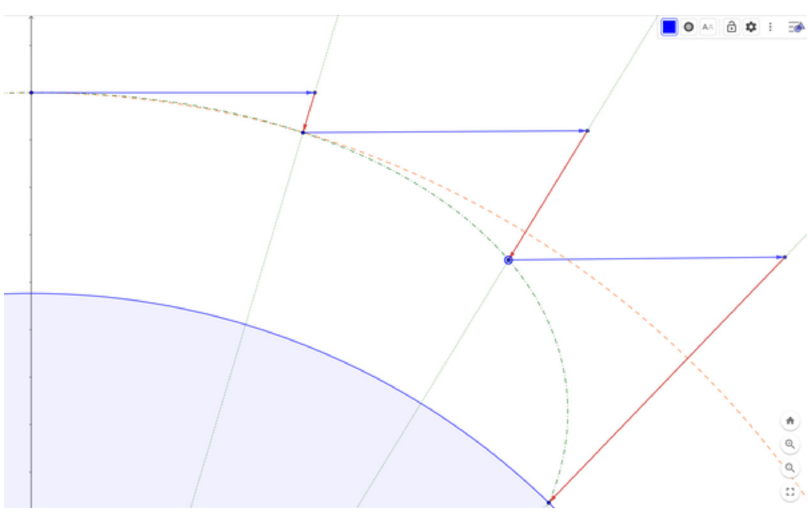


He argues that while the moon falls the distance of [s] in 1s it also moves horizontally the distance of [x] in 1s. And further he argues that while an apple falls 4.9m *"in one second"* on earth, the moon at 60 earth radii away would fall 1/r^2=1/3600 → 4.9/3600=0.0014m "in one second". Then as a corroboration he *"calculates"* [s] via s=x^2/D where [x] is the distance the moon travels in one second calculated by dividing the circumference of the orbit by 29 days, and the result in his own words *"answers pretty nearly"*. With this he is very happy and expects everyone else to be so too.

But are we? of course not, because first the corroboration is a necessity built into the construct as both calculations depend on the number of [60], and second this is only valid for one second, that is, only for the *"the first second"*, NOT for a flow of time, and thus this is a static construct, a situation frozen within the time interval of the 1st second, NOT a representation of the dynamics of bodies moving in time.

Pay attention to the direction of fall [s] in the Newton approach: it falls from the first moment radial to ***starting position***, NOT as in the "modern" version radial to end position of velocity vector, and what happens with consecutive seconds where distance fallen is 0.5g**t^2?**

In the Newton model this doesn't work at all, but let's say the gravity vector rotates as is always claimed, and the velocity vector is untouched by gravity as per terrestrial experiments and observation made already before Newton, then distance fallen proportional to square of time elapsed will always make sure the object hits ground, no matter how fast the object



galaxy:

M(SagA)=3.9x10^30x4.3x10^6=1.67x10^37kg

R=2.5x10^20m

v=220,000m/s

Let's do the same math as for the moon, first the triangle

s=x^2/2R=220000^2/5x10^20=***9.6x10^-11m***

and now using gravity for 1s: s=0.5g=***8.4x10^-13m***

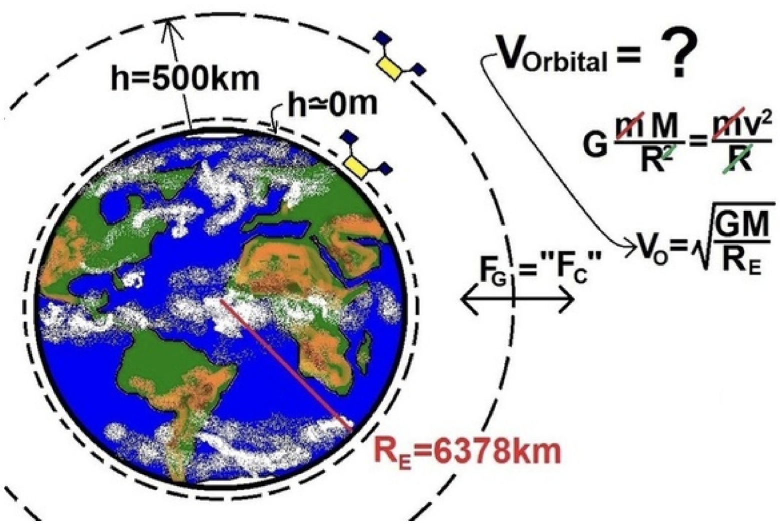
for g=GM/R^2=6.6x10^-11x1.6x10^37/6.25x10^40=1.68x10^-14m/s^2

This doesn't match by two orders of magnitude, so let's see what kind of orbital velocity the modern approach demands, that is what value for [x] would we get using this method:

x=√GM/R=√6.6x10^-11x1.6x10^37/2.5x10^20=***4.2x10^3m***

but it is claimed the sun moves ***2.2x10^5m*** in one second, which is also two orders of magnitude off, that is, much faster than allowed by Newton's universal law of gravity.

Here is a good time to talk about some of these hundreds of comments, those which absolutely deride me for claiming that the equation for orbital velocity is a gravity attenuating equation:



The faster the object the less effective gravity until ***v^2/R*** matches ***GM/R^2*** when

g(eff)=g(local)-v^2/R=0.

When F(G) and F(C) are balanced out as NASA says on their web site, we have orbit, if F(C) is greater the objects escapes, if it is smaller, it crashes. It's a tug of war between ***two*** forces, contradicting the mantra everybody repeats uncritically that there's only gravity acting: NO, v^2/R is acting and it is NOT gravity.

"You can't do that, completely off the rails, you just don't know how math works….. etc"

Tim Good went to great length to put this condescension not only into words:

"he doesn't deserve the dignity conferred on him by my answering his question …."

but also into the language of math in an attempt to prove me wrong:

Elliptical trajectory: $\frac{(y_e-c)^2}{a^2}+\frac{x_e^2}{b^2}=1$ Eq. (1) Surface of the Earth: $y_c^2+x_c^2=R_E^2$ Eq. (2)

Distance from ellipse center to ellipse focal point: $c=\sqrt{a^2-b^2}$ Eq. (3)

Distance to apogee and perigee: $R_A=a+c$ Eq. (4) $R_P=a-c$ Eq. (5)

Application of Kepler's 2nd Law: $\frac{v_P}{v_A}=\frac{R_A}{R_P}$ Eq. (6)

Change in kinetic energy from apogee to perigee: $\Delta E_v=\frac{1}{2}mv_P^2-\frac{1}{2}mv_A^2$ Eq. (7)

Change in potential energy from apogee to perigee:

$$\Delta E_G=\int_{R_P}^{R_A}\frac{GM_Em}{r^2}dr=-\frac{GM_Em}{r}\bigg|_{R_P}^{R_A}=GM_Em\left(\frac{1}{R_P}-\frac{1}{R_A}\right) \quad \text{Eq. (8)}$$

Conservation of energy: $\Delta E_v=\Delta E_G \rightarrow \frac{m}{2}(v_P^2-v_A^2)=GM_Em\left(\frac{1}{R_P}-\frac{1}{R_A}\right)$ Eq. (9)

Solve Eq. (9) for the velocity at perigee: $v_P=\sqrt{v_A^2+2GM_E\left(\frac{1}{R_P}-\frac{1}{R_A}\right)}$ Eq. (10)

Substitute Eq. (10) into Eq. (6): $\sqrt{v_A^2+2GM_E\left(\frac{1}{R_P}-\frac{1}{R_A}\right)}=v_A\frac{R_A}{R_P}$ Eq. (11)

Rearrange Eq. (11) into quadratic form:

$$R_P^2\left(1-\frac{2GM_E}{R_Av_A^2}\right)+R_P\left(\frac{2GM_E}{v_A^2}\right)+(-R_A^2)=0=AR_P^2+BR_P+C \quad \text{Eq. (12)}$$

Solve Eq. (12) for perigee using the quadratic formula: $R_P=\frac{-B\pm\sqrt{B^2-4AC}}{2A}$ Eq. (13)

Calculate the major semi-axis of the ellipse: $a=\frac{R_A+R_P}{2}$ Eq. (14)

Calculate the minor semi-axis using Eqs. (3) & (5): $b=\sqrt{a^2-(a-R_P)^2}$ Eq. (15)

Rearrange Eq. (1): $-b^2=-x_e^2-\frac{b^2}{a^2}(y_e-a+R_P)^2$ Eq. (16)

Find intersection of circle and ellipse at point J, where $x_J=x_c=x_e$ and $y_J=y_c=y_e$ by adding Eq. (2) to Eq. (16): $R_E^2-b^2=(x_J^2-x_J^2)+y_J^2-\frac{b^2}{a^2}(y_J-a+R_P)^2$ Eq. (17)

Rearrange Eq. (17) into quadratic form:

$$y_J^2\left(\frac{a^2}{b^2}-1\right)+y_J(2(a-R_P))+\left(a^2-\left(\frac{aR_E}{b}\right)^2-(a-R_P)^2\right)=0=Ay_J^2+By_J+C \quad \text{Eq. (18)}$$

Solve Eq. (18) for y_J using the quadratic formula: $y_J=\frac{-B\pm\sqrt{B^2-4AC}}{2A}$ Eq. (19)

Solve for the projectile range, x_J, by rearranging Eq. (2): $x_J=\sqrt{R_E^2-y_J^2}$ Eq. (20)

…….the result of this tour de force was ***14387.551m***

Elliptical trajectory over spherical earth:		
Apogee, R_A:	6372000	m
A_1:	-1.2411E+02	
B_1:	7.9720E+08	
C_1:	-4.06024E+13	
Perigee, R_P:	51341.6	m
Major semi-axis, a:	3211670.8	m
Minor semi-axis, b:	571968.9	m
A_2:	30.52951033	
B_2:	6320658.442	
C_2:	-1.27944E+15	
y_J:	6370983.8	m
Range, x_J:	14387.551	m

What I had proposed and what was ridiculed and made fun of was a one liner that comes directly out of the math for orbital velocity and yields exactly the same result - necessarily, as the essence of it is the same:

With the parameters used by Tim Range comes out as x=vt=v√2h/(**g-v^2/R**)=***148387.5m***

Haven't heard an apology yet…… on the contrary, he concludes with:

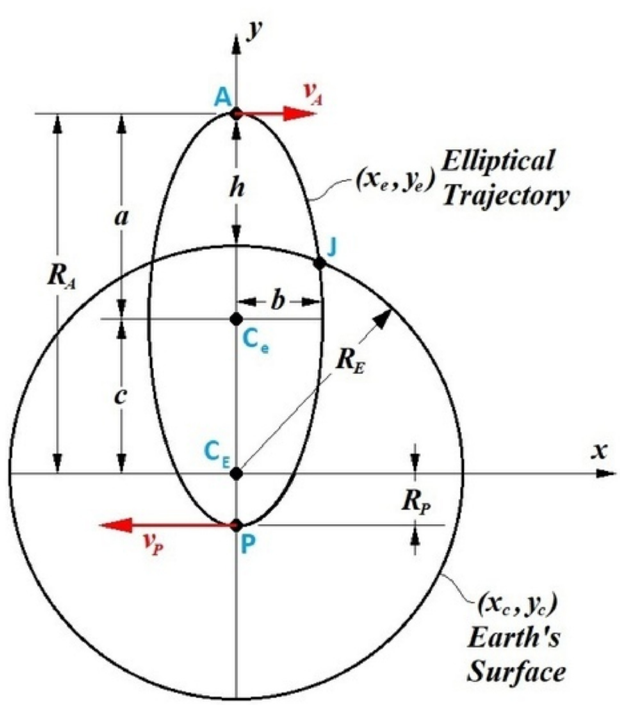
"To anyone who happens to cross paths with Michael, if you see him going on about Newton's cannonball thought experiment, or ballistic trajectories, or "hammer-throw physics" (???), or saw-tooth paths, any any related nonsense, please direct him back to this derivation of the conclusive answer to his arrogant question as a reminder that math and physics doesn't care what he thinks."

Yes, I did go back to his conclusive answer, which ***completely confirmed*** what I had been saying all along: there is a difference between a real world parabolic trajectory and a hypothetical orbital model of the same, and I made this clear in two very simple equations:

Guess what Tim came up with after a lengthy math marathon:

Input Parameters:		
Gravitational constant, G:	6.6743E-11	Nm^2/kg^2
Earth mass, M_E:	5.9722E+24	kg
Earth radius, R_E:	6371000	m
Altitude, h:	1000	m
Initial velocity, v_A:	1000	m/s
Gravity at sea level, g_0:	9.8202	m/s^2
Gravity at altitude, g_h:	9.8172	m/s^2
Parabolic trajectory over flat earth:		
Fall time, t:	14.272	s
Range, x_J:	14272.1	m

This ***14272.1m*** is the real world outcome, and thus real world trajectories are parabolic traces over a flat ground, NOT ellipses around a sphere the way he wants it to be in his sketch: here below we clearly see the red velocity vector point in opposite directions, but there is no experiment that shows gravity can do such turning around in the first place, on the contrary, all terrestrial experiments tell us gravity can't and won't do it.



PS.:

As is so often the case, comments prompt an addendum for clarification: why is it that I only need a one liner where Tim Good has to slog through the gamut of almost all math school and know that the only two parameters I need to know is ***fall time*** and ***muzzle velocity,*** everything else is irrelevant, because projectiles do not ***perform*** these curves, they just leave behind curved traces: they fall as they would in a plumb fall, while at the same time traveling uniformly ahead, so the only thing I have to do is calculate the distance traveled at speed [v] in the allotted time [t]:

x=vt=v√2h/g

That's all there is to it, that is free fall, there is no curve, no parabola, no ellipse, free fall trajectories are two superimposed rectilinear motions. When rotation is introduced, that doesn't change the behaviour of free fall, what it does is reducing the effective gravity until this becomes zero in the case of orbits: g(eff)=g(local)-v^2/r=0 for v=√GM/r… in this case distance travelled before impact becomes:

x=vt-v√2h/(g-v^2/r)=∞ for g-v^2/r=0

In cases where g-v^2/r>0 distance traveled before impact is always finite while in cases where g-v^2/r<0 the object escapes the system.

Tim's math has shown in a convoluted way what my simple math has shown all the time in a very straightforward way, and that is that applying rotational math to trajectories delivers a result that does not match terrestrial observations as well as practice, and that means it is incorrect.

PS2.:

Because there is always someone who thinks he needs to be nerdy in the comments I want to point out that obviously ***s/x=x/(D-s)*** does not clean up to ***s=x^2/D,*** but we can't really hold that against Newton, because 1.4mm is indeed negligible in the grand scheme of things where D=768.000.000.000mm. The error would show up in 13th decimal point, where clinging to it would defy the purpose of the discussion.

Nicholas Cianfanelli · Nov 7
I'll gloss over the fact that the reasoning and the maths in your post above are flawed, that horse has been beaten to death, resuscitated, and beaten to death again several times in the past month or so. If anybody's interested in that, th (more)

Michael Brenner · Nov 7
No twiddling thumbs here, Nasa has introduced v^2/r to Newton's static orbit argument, but that's all, and that is in error too, because terrestrial experiments don't support it. If you want to dig deep, try and find the experiment that (more)

Tim Good You keep attributing your formula to NASA. Kindly supply the link to this. Just…

Tim Good · Nov 7
So, Michael, I've been waiting for you to respond the past couple days since I deconstructed your "aha moment" in which you showed your "one liner" to equal my "tour de force." And you can have more time if you need it, but it's disapp (more)

Jason Homrighaus · Nov 7
He keeps trying valiantly to insist that there must be some curvature device in order for an object to follow a curving path. he quite litterally refuses to acknowledge that the direction of the gravity vector will change as the tw (more)

Michael Brenner Like Good who - when pointed out that he forgot earth rotation in his…

Tim Good · Nov 7
To anyone who would like to know the truth of this, just look to my actual post which has been updated to show where and how Michael's reasoning is in error.

I've been in a "discussion" with Michael Brenner recently on the topic of projectile trajectories and how that relates to orbital mechanics. He denies the accuracy of the description of an...

https://debunkingflatearth.quora.com/I-ve-been-in-a-discussion-wit...

7 Reply

Michael Brenner · Nov 7

As long as I come up with exactly the same answers as you in one liners, I demonstrate that I have the deeper understanding of things here. Your math marathons are just playing with muscles to impress the gullible. And the I (more)

1 Reply

Adrian Fagg I am struggling to follow your argument to be honest. Tim did the maths...

Mike Brown · Nov 8

if F(C) is greater the objects escapes, if it is smaller, it crashes So, in the Brenner Universe, there is but one sort of Earth orbit and it is metastable; it is fortunate indeed that we do not live there: by extension, there would be but available o (more)

2 Reply

Michael Brenner · Nov 8

In a way you are right because orbital mechanics only works as a two body problem, three bodies or more and math can't handle it any more. That's why all orbital mechanics is between two bodies: "There is no general closed-f (more)

2 Reply

Mike Brown There are many objects orbiting both Sun and Earth, not just one around each....

Adrian Fagg · Nov 8

Just curious. You have s/x = x/D -s I assume you mean s/x = x/(D -s) So how do you get from that to s = x^2/D I can see that that would be the dominant term for very small x, but it's obviously not generally true. And all that appears to show is th (more)

2 Reply

Tim Good · Nov 8

I alluded to that error, waiting to see if he could find it. Probably best we didn't wait too long.

2 Reply

Michael Brenner Ha, way too late guys, I mentioned that flaw many answers ago, and it's n...

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About the Author

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