How to improve Newton

(Translated from Polish into English by Andrzej Lechowski)

Abstract: In the article are presented three similar to each other mathematical functions. By means of these functions, you can describe the properties of the material field and the movement of material bodies relative to each other. One of these functions is a dependency that describes the gravitational effects in accordance with the concept of Newton. Another function, one of the other two mathematical functions, suits better to present gravitational effects than Newton's function. Using this function, you can describe the motion of the perihelion of planets, for example, the motion of the perihelion of Mercury.

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1. Introduction - Playing with numbers

Playing with numbers man inevitably becomes a mathematician. And when one becomes a mathematician, sometimes he manages to come across a very interesting mathematical dependence. From mental acuity depends whether this dependence is observed. Surely the author happened to be at the right time of sufficient mental acuity, because he noticed the following dependence... wait a minute... Before you will be presented this dependence, the reader can be asked: is there such a possibility that the sum of different numbers, that is, a+b is equal to the product of the same numbers, or a*b? Of course, for the reader is a simple question, so they know the answer - you need to solve an equation with two unknowns. Solutions of this equation are endless. To realize this, you have the one of the "unknowns" - a or b - substitute by any number and (in such a way from the resulting equation with one unknown) to calculate the value of the other unknown number. In this way, you can see that we have an infinite number of pairs of numbers, which are linked - binds them together the above dependence: a+b=a*b

One could ask the question... Is it possible that all of these numbers, which are solutions of the shown equation (or at least some part of them), were still bound together with some other functions? And if so, what is the form of the unknown functions? It seems that the solution to this problem is beyond human capabilities.
The author has managed to hit on a solution for a similar but slightly more complex dependence (equation) - this dependence is: (a+b)/2=(a*b)^0.5. It represents the symbolic equality between arithmetic and geometric mean of the numbers a and b. Solution to this equation (but only the approximate solution) are two exponential functions, which can be determined by letters a and b.

Before the sequel, yet a little swapping... Let's change symbols and instead to state the number (or function) as "a" in the rest of this article let it be stated as "Vel". At this point, let us remember also that in this way was symbolically stated the function that will be called "potential function with exponential loosening" (index at "V" stands for "exponential loosening" - or abbreviated as "el"). (To what refers does refer the name of potential and the index in a symbolic notation of the potential, we will see later in this article.) Let's trade symbol of the number "b" to "Vet". Let us remember also that in this way was symbolically stated the function that will be called the "potential function with exponential tightness" (index at the "V" stands for "exponential tightness" or in short "et").

The equation expressing the symbolic equality between arithmetic and geometric mean, you can note then in the form of: (Vel+Vet)/2=(Vel*Vet)^0.5.

2. Why "loosening" and "tightness"

In order not to keep the reader in suspense any longer on the names of these functions, let's be clear that we are here engaged in functions that can be used to describe the gravitational potential of the heavenly bodies, as well as individual particles of matter. It should be noted, that it has long been known the solution for gravity, which gave Isaac Newton. According to Newton's law of gravitation interaction between two material bodies is inversely proportional to the square of the distance. This interaction refers to the concept of force, but here we have focused on mutual acceleration that gets each body due to the existence of its neighbour. The acceleration function, which describes the acceleration of an object is the same as the function of the intensity of the gravitational field of its neighbour. This adjacent body is characterized by the fact that it is described by the parameters such as the field intensity E and the field potential V. For this reason, that the description of this field comes from Newton, the field potential can be noted with the index "n" or Vn=A*B/x, and the field intensity can be noted En=dV/dx=d(A*B/x)/dx=-A*B/x^2.

It should be clarified that the comprised in formulas product A*B is a coefficient. It replaces other coefficients in the formulas that are used in the formulas of Newton, or G (gravitational constant) and M (mass). A specific example of such a transformation can be seen in the mentioned below functions (shown together with their graphs). The first of the given there formulas is the formula for the intensity of the gravitational field by Newton En, and the next in order are Eel and Eet. It should be noted that the product of value M (mass of the Earth) and the gravitational constant G is equal to 3.975112754*10^14. But the same product is equal to the product of the coefficient of proportionality A and exponential coefficient B, or A*B. (This is important for the function Eel and Eet.) In this case the value of the exponential coefficient B=1.76612818375*10^4. So the value of the coefficient A=(3,975112754*10^14)/(1,76612818375*10^4)=2,25074985529*10^10.

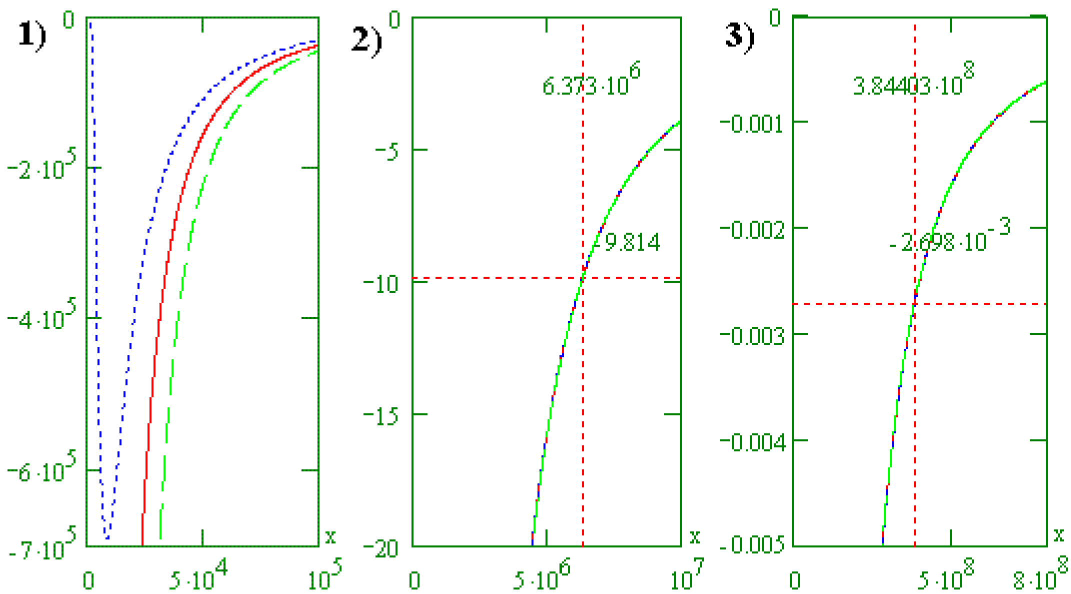
$$-\left(\frac{6.6732\cdot10^{-11}\cdot5.9736\cdot10^{24}}{x^2}\right)$$

$$-\left(\frac{3.975112754\cdot10^{14}}{x^2}\right)\cdot\exp\left(\frac{-1.76612818375\cdot10^{4}}{x}\right)$$

$$-\left(\frac{3.975112754\cdot10^{14}}{x^2}\right)\cdot\exp\left(\frac{1.76612818375\cdot10^{4}}{x}\right)$$

Mass of the Earth - 5.9736*10^24 kg
Gravitational constant - 6.6732*10^(-11) m^3*kg(-1)*s^(-2)
Earth radius - 6.373*10^6 m
Distance from the Earth to the Moon - 3.84403*10^8 m

$6.6732\cdot10^{-11}\cdot5.9736\cdot10^{24}=3.986302752\cdot10^{14}$



From a certain point of view, the exchange of coefficients shall be formal. But from another point of view, it facilitates the perception of existing dependences. The numbers in the formulas are only relative in nature and their value (in relation to the gravitational properties of matter) depends solely on conventionally adopted units of measurement (weight, length etc. Therefore, we focus here only on the relations that exist between numbers and functions. To facilitate this, no denominations of units of measure do not occur by numbers. Numbers and functions speak for themselves, without adducing conventional units of measure.

As regards the concepts of "loosening" and "tightness", they are associated with orbits in which bodies are moving when create a stable system. If the potential and intensity of the gravitational field of bodies would evolve exactly according to Newton's law, or would have the form: Vn=A*B/x i En=-A*B/x^2, then orbits of bodies had a perfect shape - were ellipses or circles. When in a stable system of two rotating bodies field parameters - the potential and the field intensity - differ from what is described by Newton's law, then instead of the ellipse is formed either the orbit with loosening of of the trajectory loop, or the orbit with tightness of the trajectory loop. Such orbits are shown in the following figures.

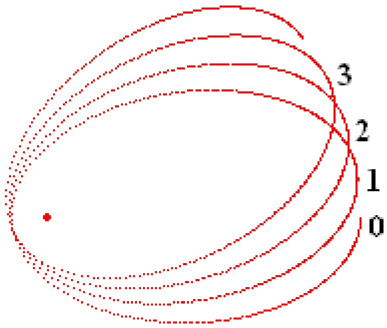


Figure OEL. The orbit of a celestial body with exponential loosening - Orbit EL (exponential loosening - Periapsis and apoapsis motions - in the figure there are marked subsequent locations of apocentre.

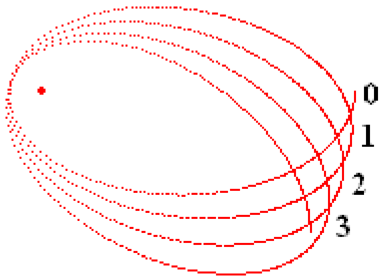


Figure OET. The orbit of a celestial body with exponential tightness - Orbit ET (exponential tightness) - Periapsis and apoapsis motions - in the figure there are marked subsequent locations of apocentre.

About the elliptical orbit we can say that it is formed as a closed line thanks to a special combination of circumstances. This coincidence is simply due to the fact that the function of the gravitational field, which (in a sense) controls the acceleration of the body in orbit, has just such, and not the other, course. With just such course of changes of the gravitational field the body after one revolution in orbit goes exactly on the same trajectory, in which it moved during the previous cycle in orbit. Loosened orbit or tightened orbit arises when the distribution of the gravitational field is such, that it prevents repetition of motion in an elliptical orbit.

The acceleration in the gravity field (in relation to acceleration which is described in Newton's law) is either increased or reduced. Increased acceleration is the reason why the body quicker moves to a place that is maximally distant from the centre of the field (ie, from one maximum distance to the next maximum distance). As a result, it arrives there earlier, before elapse of time of completing of full rotation of the body in orbit. Therefore, it will not come to the same (maximally distant from the centre) position in orbit, which was performed in the previous rotation. Thus forms the orbit of the exponential loosening.

On the other hand, reduced acceleration in gravitational field is the reason why the body is moving slower to a place that is maximally distant from the centre of the field. As a result, it arrives there only then, when already elapsed (and is exceeded) time of completing of full rotation of the body in orbit. Thus forms the orbit of the exponential tightness.

For the record we have to look at the obvious thing, namely, that rotational motion of the body in orbit is not uniform. The rotational motion also varies due to changes in potential of gravitational field. So this kind of race that determines what type of orbit will rise (orbit according to Newton, orbit of loosening or orbit of tightness), occurs between the changing angle of rotation of radius-vector of a body and changing length of the vector. (It stands to reason that relations between the angle of rotation of the vector and the length of the vector are the theoretical relations that exist in an appropriate coordinate system.)

These orbits are the result of the existence of such a spatial distribution of the gravitational field of bodies, that its gravitational potential can be described either by means of function of the potential of exponential loosening Vel and function of intensity of this field Eel, or by means of the potential function of the exponential tightness Vet and function of intensity of this field Eet. These mathematical functions and their graphs are shown in the following figures.

$$Vel = 10 \cdot \left(1 - \exp\left(\frac{-0.001}{x}\right)\right)$$

$$Vn = \frac{0.01}{x}$$

$$Vet = -10 \cdot \left(1 - \exp\left(\frac{0.001}{x}\right)\right)$$

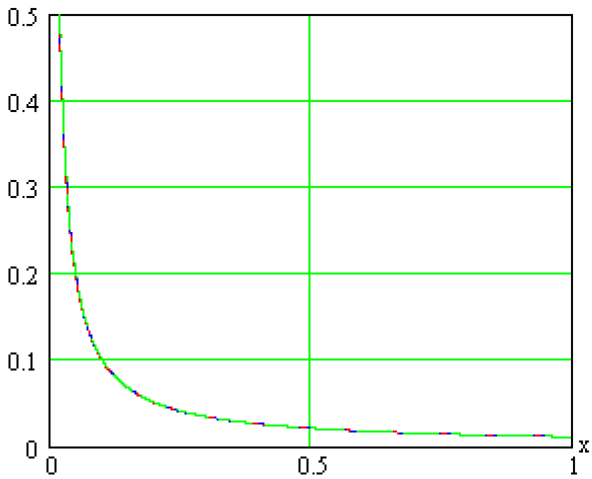


Figure PN1a

$$Vel = 10 \cdot \left(1 - \exp\left(\frac{-0.001}{x}\right)\right)$$

$$Vn = \frac{0.01}{x}$$

$$Vet = -10 \cdot \left(1 - \exp\left(\frac{0.001}{x}\right)\right)$$

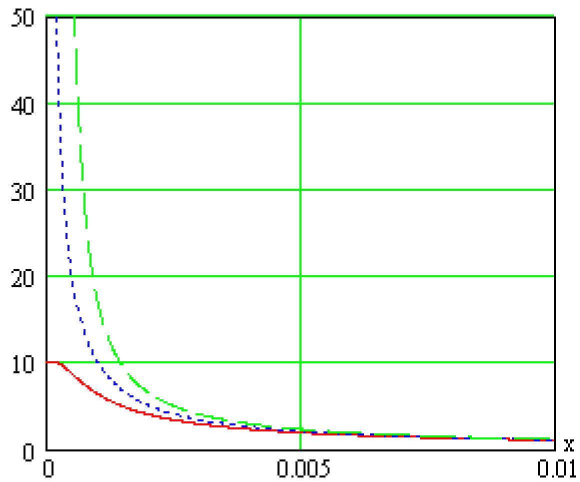


Figure PN1b

$$Eel = \frac{d}{dx} 10 \cdot \left(1 - \exp\left(\frac{-0.001}{x}\right)\right)$$

$$En = \frac{d}{dx} \frac{0.01}{x}$$

$$Eet = \frac{d}{dx} -10 \cdot \left(1 - \exp\left(\frac{0.001}{x}\right)\right)$$

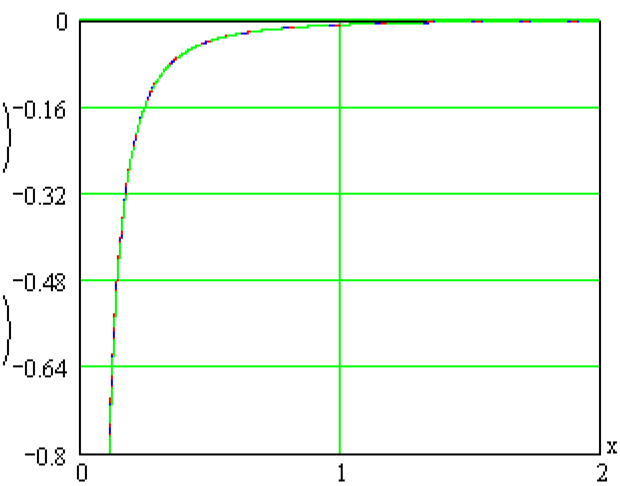


Figure PN2a

$$Eel=\frac{d}{dx}10\cdot\left(1-\exp\left(\frac{-0.001}{x}\right)\right)$$

$$En=\frac{d}{dx}\frac{0.01}{x}$$

$$Eet=\frac{d}{dx}-10\cdot\left(1-\exp\left(\frac{0.001}{x}\right)\right)$$

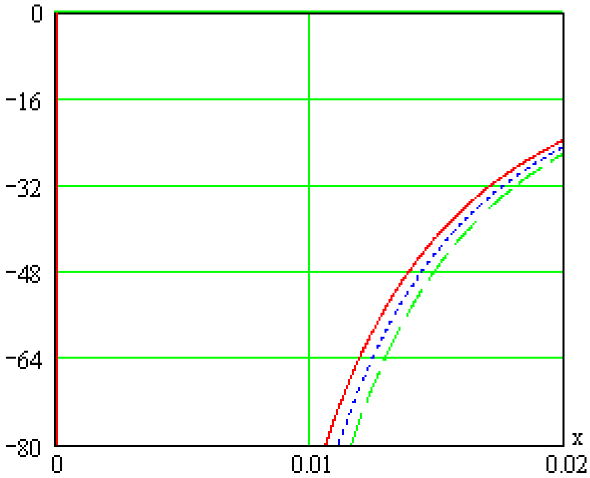


Figure PN2b

It is in the descriptions of the presented functions has been used discretion in choosing the numbers to determine the parameters. There are no units of measurement. Because these functions do not describe the gravitational field of any particular body or particle and do not refer to any of the measure systems.

3. Properties of three functions of field

One of the interesting interdependences between functions of the field intensity Eel, En and Eet is such that at each (any but positive) distance x absolute value of the field intensity En is equal to the geometric mean calculated from absolute values of the field intensity Eel and field intensity Eet, or En=A*B/x^2=(Eel*Eet)^0.5=((A*B/x^2)*exp(-B/x)*(A*B/x^2)*exp(B/x))^0.5=A*B/x^2.

The graphs show that with long-distances x from the centre of each of these three fields, their parameters change in a similar manner. Thus also the arithmetic mean of the values of the parameters (of the specified distance x) is very close to the geometric mean of these parameters values. So you can write that $(Eel\cdot Eet)^{0.5}\cong\frac{Eel+Eet}{2}$.

With increasing values of the distance x from the centre of each of these fields, the difference between them becomes smaller, that is also becoming smaller the difference between the geometric mean and the arithmetic mean values of these field functions. Such a conclusion can be drawn from the above and from the following charts.

$$Eel=-\left(\frac{10\cdot 0.001}{x^2}\cdot\exp\left(\frac{-0.001}{x}\right)\right)$$

$$En=-\frac{0.01}{x^2}$$

$$Eet=-\left(\frac{10\cdot 0.001}{x^2}\cdot\exp\left(\frac{0.001}{x}\right)\right)$$

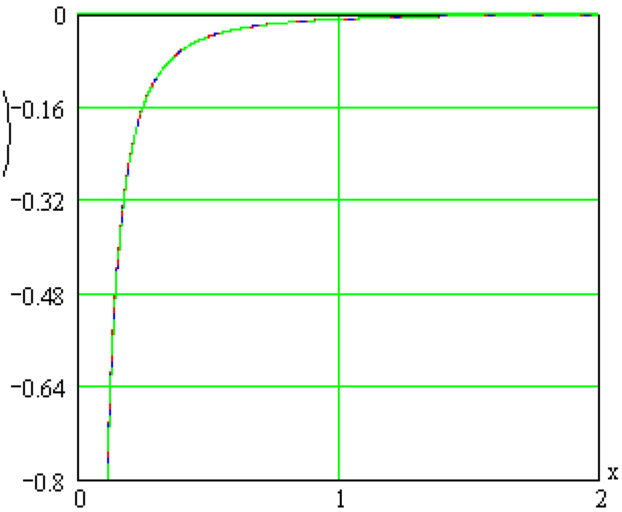


Figure PN3a

$$Eel = -\left(\frac{10\cdot 0.001}{x^2}\cdot \exp\left(\frac{-0.001}{x}\right)\right)$$

$$En = -\frac{0.01}{x^2}$$

$$Eet = -\left(\frac{10\cdot 0.001}{x^2}\cdot \exp\left(\frac{0.001}{x}\right)\right)$$

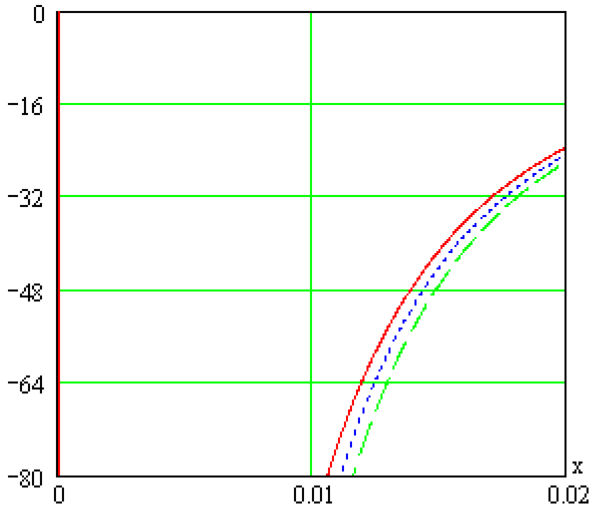


Figure PN3b

The graphs in these figures are the same as in Fig PN2a and PN2b, and they are repeated here as well so that the reader can compare (no need to calculate derivatives of functions), the structure of function Eel and of function Eet with the structure of function En and compare the sequences these functions in a coordinate system.

Coming back to the comparison with each other arithmetic mean and the geometric mean, which is the approximate equation $(Eel\cdot Eet)^{0.5} \cong \frac{Eel + Eet}{2}$, decrease in the difference between the arithmetic mean and geometric mean, which occurs with increasing distance x from the centre of the field, you can also see in the after-mentioned two examples of calculation.

$$x = 2$$

$$Vel = 10\cdot\left(1 - \exp\left(\frac{-0.001}{x}\right)\right) \qquad Vet = -10\cdot\left(1 - \exp\left(\frac{0.001}{x}\right)\right)$$

$$(Vel\cdot Vet)^{0.5} = 5.0000000520828\cdot 10^{-3}$$

$$\frac{Vel+Vet}{2} = 5.0000002083328\cdot 10^{-3}$$

$$\frac{Vel+Vet}{2} - (Vel\cdot Vet)^{0.5} = 1.56250002519842\cdot 10^{-10}$$

$$x = 20$$

$$Vel = 10\cdot\left(1 - \exp\left(\frac{-0.001}{x}\right)\right) \qquad Vet = -10\cdot\left(1 - \exp\left(\frac{0.001}{x}\right)\right)$$

$$(Vel\cdot Vet)^{0.5} = 5.00000000052417\cdot 10^{-4}$$

$$\frac{Vel+Vet}{2} = 5.00000000208667\cdot 10^{-4}$$

$$\frac{Vel+Vet}{2} - (Vel\cdot Vet)^{0.5} = 1.56250012928183\cdot 10^{-13}$$

It is true that these examples refer to the arithmetic mean and the geometric mean of the two functions of the field potential, and not functions of the field intensity, but the relations between sequences of these functions (as seen in graphs - figure PN1b and figure PN2b) are similar. So, as can be seen, for the equation (a+b)/2=(a*b)^0.5 we have here two forms of solutions, two sets of functions, wherein the sets of solutions - mathematical functions - are mathematically related together in such a way that some functions are initial, and the other ones - are derivatives of these functions.

4. Final conclusions

Based on the above, can be drawn the most important conclusion, that affects the gravitational constant G - the coefficient for various celestial bodies, and also for various particles, it is not at all constant value. (The matter is not about that, that it will be different when using various systems of measurement.) What's the reason that the value G is different for various bodies and particles? First of all, this proposal is the result of the fact that Newton's law of gravity, the formula En=G*M/x^2, does not describe the exact gravitational fields existing in the nature of heavenly bodies. About the inaccuracy of Newton's equation shows the existence of perihelion motion of planets in the Solar System and binary stars periapsis motion, for example, as in the case of double star PSR B1913 +16. And Newton's law of gravity does not provide such movements - according to him (and more precisely, on the basis resulting from the application of this law), when there is no external interference, the two orbiting bodies, such as a double star, should move along elliptical orbits.

In the article are presented two mathematical functions of field intensity, which in structural terms (especially over long distances) are similar to the function of field intensity by Newton, and carried out by means of them calculations give almost identical results. Of course, this is done by a suitable choice of the coefficients A and B for the function Eel and Eet. One of these functions, namely, the function of the field intensity of the exponential tightness Eet, is so structured, that changing the value of the coefficients A and B you can use it to describe the orbital motions of various celestial bodies, in which there are various degrees of tightness of an orbit. The accordant coefficients A and B, used for the determination of the gravitational field of the given body, will be characteristic parameters right for a given body. In case of another celestial body, in the field of which the orbit of the moving body has quite a different degree of tightness, there will be completely different values of the coefficients A and B.

When applying a reverse conversion, ie, instead of the product of A*B (when its value is known) use the product G*M and from the value of the product to calculate the mass M by previously known method, then assuming G as a constant value, you finally obtain an incorrect result for the mass M.

It can be assumed that the parameter G for the celestial bodies of the Solar System is approximately constant. Decisive impact on the value of this parameter is due to the Sun. For planets of SS values of G parameter differences are so small that they are unnoticeable. The big difference between the mass of each planet of the SS and the mass of the Sun makes, that the Sun dominates in interactions. This is similar situation to the one, with which Galileo had to do, when he dropped stones of different weights from the high tower. Then, in his experiments, the decisive role played the Earth and it was clear that the stones of different mass don't fall from the tower in a different way. Thus, for the conditions that exist in the Solar System value of the parameter G can be regarded as a constant, because the differences are so small that almost undetectable. But the use of the same value G in the calculation for the entire cosmos, and especially for extremely massive celestial bodies, which are components of double stars, will undoubtedly lead to an incorrect estimation of their masses.

In this case you should look more broadly... The value of the parameter G for the Solar System is completely different than the value G, which is calculated on the basis of results of gravitational interactions of two masses of a few or a dozen pounds in a laboratory experiment. So, using the value G, which is based on laboratory experiments, to calculate the parameters of celestial bodies of the Solar System also leads to erroneous calculation of the masses of these heavenly bodies.

These calculation errors on the mass of celestial bodies that are created for the cause of adoption erroneous assumption that G is a constant value, are sufficiently important reason to revise hitherto views and in a new way to look at the gravitational effects of celestial bodies and their constituent particles.

The presented Eel and Eet functions can be used to describe both the field of celestial bodies, as well as for individual particles of matter. So far, there have not been found to exist in nature gravitational fields in which appear orbits of loosening of motion of bodies or particles. But such orbits may be discovered in the future. And even if similar type of orbits are absent in nature, then function of field intensity of loosening Eel is ideal for explanation and interpretation of the natural phenomena that exist at the nano-scale.

On the occasion of Mother's Day
"How to improve Newton"
dedicated to my mum,
Helena Szenkaryk

Bogdan Szenkaryk "Pinopa"
Poland, Legnica, 2013.05.26.