DISINTEGRATION OF EINSTEINIAN GENERAL RELATIVITY, TOWARDS A NEW ECE COSMOLOGY.

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ABSTRACT

It is shown by a combination of incisive analysis and computational methods that the Einsteinian general relativity is severely self-inconsistent. In order to replace it completely, a new cosmology is suggested based on the correct antisymmetry of the Christoffel connection and metric compatibility subject to the Evans identity of differential geometry. The disintegration of Einsteinian relativity begs the question of whether the claims to precision in tests of the theory can ever be meaningful, the basic theory being riddled with errors of concept and mathematics.

Keywords: ECE theory, new cosmology, disintegration of Einsteinian general relativity.

UFT 190

1. INTRODUCTION

In recent papers of this series of 191 papers to date {1 -10}, the beginnings of a new cosmology have been forged using the antisymmetric Christoffel connection, the metric compatibility equation and Evans identity of differential geometry. The results have been expressed in terms of the metric of spherical spacetime {11} and a function m of the radial coordinate r of the cylindrical polar system. This metric has been used to describe an orbit in a plane. In this paper it is shown that the Einsteinian general relativity is severely self inconsistent and essentially disintegrates under the mildest scholarly scrutiny. This fragility of Einstein's general relativity has been known for more than ninety years, but has been ignored for obscure, non-scientific, reasons. In UFT 150 and 155 of this series, and in various essays and broadcasts on www.aias.us,, the Einsteinian theory of light deflection and time delay is heavily criticised. In the monograph of reference (2), "Criticisms of the Einstein Field Equation", all metrics of the equation are shown to be incorrect computationally due to neglect of torsion. Crothers in that monograph {2} gives a review of his own and other criticisms of the Einstein field equation. In ref. {12}, Einstein's calculation of the precession of the ellipse is heavily criticised. Less than a month after this paper appeared in late 1915, K. Schwarzschild {12} pointed out basic errors in it in a letter to Einstein in which Schwarzschild proposed a metric. This does not take the format of the so called "Schwarzschild metric" used in "standard" physics, now an entirely obsolete subject. This is pointed out most clearly by Crothers {2} and in ref. {12}, in which it is pointed out that this paper on precession is essentially the only one written by Einstein on the topic.

In Section 2 it is shown straightforwardly that the so called Schwarzschild solution does not give an ellipse in general, and that it does not reduce correctly to the Newtonian limit. So called "precision tests" of the Einstein theory are therefore meaningless. This has been known since the late nineteen fifties through the velocity curve of a spiral galaxy, but again facts have been ignored in favour of dogma and "dark matter". In contrast the new ECE cosmology based on the m function is able to describe solar system and galactic orbits with the correct geometry and symmetry. In Section 3 a computational analysis is made of some of Einstein's claims, and the claims of those who adhere to the "Schwarzschild dogma". It is shown that they fail on every count.

2. MATHEMATICS IN PLACE OF DOGMA

Consider an orbit in a plane defined by:

$$dZ = 0. \quad -(1)$$

In the spherically symmetric spacetime the infinitesimal line element in cylindrical polar coordinates is:

$$ds^2 = c^2 d\tau^2 = m(r)\, c^2 dt^2 - m^{-1}(r)\, dr^2 - r^2 d\theta^2 \quad -(2)$$

where in general m can be a function of r and t {11}. Here τ is the proper time and m the mass of an object in orbit, such as a planet. In this section the function m is considered to be a function only of r. The hamiltonian is:

$$H = \frac{1}{2} mc^2 = \frac{1}{2} m \left(m(r) \left(\frac{dt}{d\tau} \right)^2 - \frac{1}{m(r)} \left(\frac{dr}{d\tau} \right)^2 - r^2 \left(\frac{d\theta}{d\tau} \right)^2 \right). \quad -(3)$$

The constants of motion {1 - 10} are the total energy:

$$E = m(r)\, mc^2 \frac{dt}{d\tau}, \quad -(4)$$

the angular momentum

$$L = mr^2 \frac{d\theta}{d\tau}, \quad -(5)$$

and the linear momentum

$$p = \frac{m}{m(r)} \frac{dr}{d\tau} . \quad -(6)$$

Therefore Eq. (3) is:

$$\frac{1}{2} m \left(\frac{dr}{d\tau}\right)^2 = \frac{1}{2}\left(\frac{E^2}{mc^2} - m(r)\left(mc^2 + \frac{L^2}{mr^2}\right)\right) . \quad -(7)$$

The orbital equation is obtained from:

$$\frac{dr}{d\tau} = \frac{dr}{d\theta}\frac{d\theta}{d\tau} = \frac{L}{mr^2}\frac{dr}{d\theta} . \quad -(8)$$

From Eqs. (7) and (8):

$$\frac{1}{m}\left(\frac{L}{r^2}\right)^2 \left(\frac{dr}{d\theta}\right)^2 = \frac{E^2}{mc^2} - m(r)\left(mc^2 + \frac{L^2}{mr^2}\right) \quad -(9)$$

so:

$$\left(\frac{dr}{d\theta}\right)^2 = r^4\left(\frac{1}{b^2} - m(r)\left(\frac{1}{a^2} + \frac{1}{r^2}\right)\right) \quad -(10)$$

where the constants a and b have the units of metres and are defined by:

$$a = \frac{L}{mc} , \quad b = \frac{Lc}{E} . \quad -(11)$$

Therefore:

$$\frac{dr}{d\theta} = r^2\left(\frac{1}{b^2} - m(r)\left(\frac{1}{a^2} + \frac{1}{r^2}\right)\right)^{1/2} \quad -(12)$$

for any spherically symmetric spacetime.

The tangential velocity of the planet is obtained from:

$$v = \frac{dr}{dt} = \frac{dr}{d\tau}\frac{d\tau}{dt} = \frac{dr}{d\theta}\frac{d\theta}{d\tau}\frac{d\tau}{dt} \quad -(13)$$

with:

$$\frac{d\theta}{d\tau} = \frac{L}{mr^2}, \quad \frac{d\tau}{dt} = \frac{m(r)}{E} mc^2. \quad -(14)$$

So

$$v = cbm(r)\left(\frac{1}{b^2} - m(r)\left(\frac{1}{a^2} + \frac{1}{r^2}\right)\right)^{1/2} \quad -(15)$$

and again this is true for any spherically symmetric spacetime.

The angular velocity of the orbit is obtained from:

$$\omega = \frac{d\theta}{dt} = \frac{d\theta}{dr}\frac{dr}{dt} = cb\frac{m(r)}{r^2} \quad -(16).$$

and this is the simplest test of general relativity. Yet this test seems never to have been applied experimentally.

The so called "standard model" of physics uses a function:

$$m(r) = 1 - \frac{r_0}{r} \quad -(17)$$

where:

$$r_0 = \frac{2MG}{c^2}. \quad -(18)$$

Here G is Newton's constant, c the speed of light and M the mass of the attracting object. In the solar system M is the mass of the sun. In his letter to Einstein of Dec. 1915 {12}, Schwarzschild proposed the function:

$$m(r) = 1 - \frac{\gamma}{(R^3 + r_0^3)^{1/3}} \quad -(19)$$

where R is not r. Schwarzschild's function (19) does not have a singularity, unlike the function (17). It is unknown who introduced function (17) and fabricated its source historically.

It is claimed {11} that the function (17) produces a precessing ellipse:

$$r = \frac{\alpha}{1+\epsilon\cos(x\theta)} \quad -(20)$$

where 2α is the latus rectum, ϵ the eccentricity and x a constant. The methods underlying this claim are given in detail in note 190(9) on www.aias.us. They are dubious because they rely on the self contradiction of "effective potential" from Eq. (12) used in the classical or Newtonian description, and also rely on dubious approximations explained in note 190(9). Finally, planetary data {11} do not verify the theory. The precession of the ellipse is a particularly difficult piece of data to choose because it is influenced by other factors well known in astronomy. Einstein {12} wrote only one paper on this topic and then abandoned it. In order to test this claim correctly the following equation must be used (note 190(7)):

$$\frac{dr}{d\theta} = \frac{x\alpha\epsilon\sin(x\theta)}{(1+\epsilon\cos(x\theta))^2} = r^2\left(\frac{1}{b^2} - m(r)\left(\frac{1}{a^2}+\frac{1}{r^2}\right)\right)^{1/2} \quad -(21)$$

so the m function needed for a precessing ellipse is:

$$m(r) = \frac{a^2}{r^2(a^2+r^2)}\left(\frac{r^4}{b^2} - \left(\frac{x\alpha\epsilon}{(1+\epsilon\cos(x\theta))^2}\right)^2\sin^2(x\theta)\right) \quad -(22)$$

where

$$\cos(x\theta) = \frac{1}{\epsilon}\left(\frac{\alpha}{r} - 1\right). \quad -(23)$$

It is shown using Maxima (computer algebra) in Section 3 that in general this function is not the function (17). So the Einstein field equation does not produce a precessing ellipse in general. However, the function (22) can be described by suitable parameterization of the fundamental m function (1 - 10) of ECE cosmology:

$$m(r) = 2 - \exp\left(2\exp\left(-\frac{r}{R}\right)\right). \quad -(24)$$

It is not known whether Einstein himself ever used the function (17), but Eq. (17) saturates the standard dogma as an archetypical idol of the cave. Writing out Eq. (15) it becomes:

$$v = \frac{mc^2}{E}\left(1-\frac{r_0}{r}\right)\left(\frac{E^2}{m^2c^2} - c^2 - \frac{L^2}{m^2r^2} + \frac{2MG}{r} + \frac{2MGL^2}{m^2c^2r^3}\right)^{1/2}. \quad -(25)$$

It is further claimed that this function reduces to Newton's:

$$v = \left(\frac{2E}{m} + \frac{2MG}{r} - \frac{L^2}{m^2r^2}\right)^{1/2} \quad -(26)$$

where in Eq. (26), the total energy is:

$$E = \frac{1}{2}mv^2 + \frac{L^2}{2mr^2} - \frac{MG}{r}. \quad -(27)$$

Even without computer algebra it is seen that Eq. (25) never reduces to Eq. (27) for the following reasons.

1) It has to be assumed that:

$$\frac{mc^2}{E}\left(1-\frac{r_0}{r}\right)=1. \quad -(28)$$

2) It has to be assumed that:

$$\frac{E^2}{m^2c^2}-c^2=\frac{2E}{m} \quad -(29)$$

3) If it is assumed that in Eq. (28):

$$E=mc^2, \quad 1-\frac{r_0}{r}=1, \quad -(30)$$

then it must also be assumed that:

$$v=cb\left(\frac{1}{b^2}-\frac{1}{a^2}-\frac{1}{r^2}\right) \quad -(31)$$

and this never gives Eq. (26).

4) From Eq. (29):

$$E^2-2Emc^2-m^2c^4=0 \quad -(32)$$

i. e.

$$E=\left(1\mp\sqrt{2}\right)mc^2 \quad -(33)$$

and this contradicts Eq. (30).

The dogmatists claim that

$$E=mc^2\left(1-\frac{r_0}{r}\right)\frac{dt}{d\tau} \quad -(34)$$

in the metric:

$$c^2d\tau^2=c^2dt^2\left(1-\frac{r_0}{r}\right)-\left(1-\frac{r_0}{r}\right)^{-1}dr^2-r^2d\theta^2. \quad -(35)$$

By definition:

$$c^2d\tau^2=c^2dt^2\left(1-\frac{r_0}{r}\right)-d\underline{r}\cdot d\underline{r} \quad -(36)$$

where:

$$\underline{dr} \cdot \underline{dr} = v^2 dt^2 \quad -(37)$$

So:

$$c^2 d\tau^2 = c^2 dt^2 \left(1 - \frac{r_0}{r}\right) - v^2 dt^2 \quad -(38)$$

and:

$$\frac{dt}{d\tau} = \left(1 - \frac{r_0}{r} - \frac{v^2}{c^2}\right)^{-1/2} \quad -(39)$$

The total energy is therefore:

$$E = mc^2 \left(1 - \frac{r_0}{r}\right)\left(1 - \frac{r_0}{r} - \frac{v^2}{c^2}\right)^{-1/2} = \text{constant}. \quad -(40)$$

This may be approximated by:

$$\frac{E}{mc^2} \sim \left(1 - \frac{r_0}{r}\right)\left(1 + \frac{1}{2}\left(\frac{r_0}{r} + \left(\frac{v}{c}\right)^2\right)\right) \quad -(41)$$

if:

$$\frac{r_0}{r} \ll 1, \quad \frac{v}{c} \ll 1. \quad -(42)$$

However from Eq. (30)

$$\frac{E}{mc^2} = 1 \quad -(43)$$

in which case:

$$\frac{r_0}{r} \to 0 \quad -(44)$$

and

$$\frac{E}{mc^2} \rightarrow 1 + \frac{1}{2}\left(\frac{v}{c}\right)^2 \quad -(45)$$

This result is usually interpreted as the relativistic kinetic energy of special relativity for a free particle m and no attractive potential. The procedure of trying to force Eq. (40) to become Eq. (27)

means that mc^2 must be subtracted from E, and that the potential of attraction must vanish. In this case however the contradiction (31) is present. Comparing Eqs (45) and (30) the velocity vanishes! The Schwarzschild dogma cannot give the Newtonian limit, contrary to saturation propaganda.

Numerical methods as in Section 3 show this in another way by using

$$v = cbm(r)\left(\frac{1}{b^2} - m(r)\left(\frac{1}{a^2} + \frac{1}{r^2}\right)\right)^{1/2} = \left(\frac{2E}{m} + \frac{2MG}{r} - \frac{L^2}{m^2r^2}\right)^{1/2} \quad -(46)$$

in which case the Newtonian limit can be obtained from the dogmatists if and only if the following cubic is solved for m , and then if and only if the result is Eq. (17). The actual result from computer algebra is an intricate function of r that never becomes Eq. (17). Even worse for the dogmatists is that the m function from Eq. (46) is not the same as the m function from Eq. (22), and neither is Eq. (17). So the Einsteinian general relativity disintegrates under the mildest and most obvious scholarly scrutiny.

The only way forward is to adopt the correct ECE theory in a series of new experiments designed to produce a self consistent function m (r). By Ockham's Razor the simplest experiment or astronomical observation is that of the angular velocity:

$$\omega = \frac{d\theta}{dt} = cb\frac{m(r)}{r^2} \quad -(47)$$

by measuring the displacement of angle θ in time t directly, and by measuring the distance r directly. Contemporary methods can be used with great precision. These astronomical observations give $m(r)$ directly. If the orbital linear velocity of for example a planet can be measured unequivocally without hidden assumptions, then:

$$v = cbm(r)f(r), \quad f(r) = \left(\frac{1}{b^2} - m(r)\left(\frac{1}{a^2} + \frac{1}{r^2}\right)\right)^{1/2} \quad -(48)$$

and the function m should be the same, experimentally, as found from Eq. (47). If this is not true then the spacetime is not spherically symmetric, or general relativity is not valid. This test requires knowledge of the total energy E and angular momentum L. Finally, if the orbit can be measured unequivocally without hidden assumptions, the same m should be found from:

$$\frac{dr}{d\theta} = r^2 f(r). \quad -(49)$$

As shown in detail in note 190(15), (www.aias.us), there are some dubious assumptions in the textbook approach to Kepler's second law (equal areas in equal times). Astronomical measurements are all inter-related, so great care must be taken to determine whether some hidden assumption is present in them. The optimal method would be to measure quantities as directly as possible. Having determined the m function experimentally, it can be fitted to the fundamental function (24) given by geometry. Computer algebra must be used to find the correct method of reaching the Newtonian limit, which must be a limit of the m function. In the case of angular velocity for a circular orbit, Eq. (47) shows that the Newtonian limit is:

$$\omega = \frac{cb}{r^2} \quad -(50)$$

The reader is referred to background notes 190(1) to 190(15) on www.aias.us for more details.

Finally in this Section the problem of the whirlpool galaxy is considered by using the observation that the stars are arranged in a logarithmic spiral:

$$r = r_0 \exp(\alpha\theta) \quad -(51)$$

of high pitch α , which means that the outer arms become straight lines as observed directly in astronomy. The whirlpool galaxy is characterized by its well known velocity curve, in which the orbital velocity v becomes constant as the radial coordinate r becomes infinite. This is completely non Einsteinian and non Newtonian. From Eq. (51):

$$\frac{dr}{d\theta} = \alpha r \quad -(52)$$

and from Eqs. (52) and (12):

$$g(r) = \frac{\alpha}{r}. \quad -(53)$$

Therefore the orbital velocity is:

$$v = \frac{cb\alpha}{r}\left(\frac{r^2}{b^2} - \alpha^2\right)\left(\frac{a^2}{r^2+a^2}\right). \quad -(54)$$

Astronomical data show that as:

$$r \rightarrow \infty, \quad v \rightarrow v_\infty = \text{constant}. \quad -(55)$$

From Eq. (54):

$$v = cb\alpha\left(\frac{r}{b^2} - \frac{\alpha^2}{r}\right)\left(\frac{a^2}{r^2+a^2}\right) \quad -(56)$$

i.e.

$$v = \frac{ca^2}{b}\alpha\left(\frac{r}{r^2+a^2}\right) - \frac{cb\alpha^3}{r}\left(\frac{a^2}{r^2+a^2}\right). \quad -(57)$$

In the limit:

$$r \to \infty, \quad \alpha \to \infty \quad -(58)$$

so:

$$\lim_{r\to\infty} \frac{a^2}{r^2+a^2} \to 0. \quad -(59)$$

Therefore:

$$v \to v_\infty = \frac{ca^2}{b}\alpha\left(\frac{r}{r^2+a^2}\right). \quad -(60)$$

Considering the limit:

$$\lim_{r\to\infty} \frac{r}{r^2+a^2} = \lim_{r\to\infty} \frac{1}{r}\left(1+\frac{a^2}{r^2}\right)^{-1} \to \frac{1}{r} \quad -(61)$$

the limiting velocity is:

$$v_\infty \to \frac{ca^2}{b}\left(\frac{\alpha}{r}\right) \quad -(62)$$

and is a constant if:

$$\frac{\alpha}{r} \to \text{constant}. \quad -(63)$$

The dogma fails for the whirlpool galaxy because it asserts that the function (17) gives the Newtonian limit, in which case the velocity curve reaches a maximum and falls back again to zero, in complete contradiction of the data, where the velocity curve reaches a plateau.

Disintegration of Einsteinian general relativity, towards a new ECE cosmology

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Abstract

Keywords:

1 Introduction

2 Mathematatcs in place of dogma

3 Numerical analysis with Maxima

We give some examples for the nature of the function $m(r)$ in various contexts showing that inconsistencies for this function arise. There is no transition from Einsteinian theory to Newtonian mechanics.

The angular change or radius for an orbiting body is in Einsteinian as well as ECE theory given by

$$\frac{dr}{d\theta} = r^2 \left(\frac{1}{b^2} - m(r) \left(\frac{1}{a^2} + \frac{1}{r^2} \right) \right)^{1/2} \tag{64}$$

where the functions $m(r)$ are given by

$$m(r) = 1 - \frac{r_0}{r} \tag{65}$$

in Einsteinian and

$$m(r) = 2 - \exp\left(2 \exp(-\frac{r}{R}) \right) \tag{66}$$

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in ECE theory with constants of motion

$$a = \frac{L}{m\ c},\quad b = \frac{L\ c}{E}, \tag{67}$$

see Eqs. (11), (12), (17) and (24). The simplest transition to Newtonian theory would be

$$m(r) \to 1. \tag{68}$$

Then Eq. (65) becomes

$$\frac{dr}{d\theta} \to r^2 \left(\frac{1}{b^2} - \frac{1}{a^2} - \frac{1}{r^2} \right)^{1/2}. \tag{69}$$

Because of (68) it is

$$\frac{a}{b} = \frac{E}{m\ c^2}. \tag{70}$$

Since E consists of the rest energy plus kinetic energy we have

$$E > mc^2, \tag{71}$$

hence

$$a > b \ \text{ and } \ \frac{1}{a^2} < \frac{1}{b^2} \tag{72}$$

but the difference is small because of the huge rest energy of a celestial body. Consequently the condition from (69) for obtaining a real value of the square root,

$$\frac{1}{b^2} \geq \frac{1}{a^2} + \frac{1}{r^2}, \tag{73}$$

can barely be fulfilled for $a \approx b$. The condition is much easier to fulfill for $m(r) < 1$, which is guaranteed for all values of r. This can be seen from the graphs of Fig. 1 and 2. In Fig. 1 there are bound states for the m functions of Einsteinian and ECE theory which are compatible with elliptic orbits. However, in order to obtain a non-negative square root argument for $m = 1$, one has to choose $a >> b$. This is typical for the non-relativistic case. In other words, the function $m = 1$ can only be used in the non-relativistic case where the r-dependent m function is defined for total energies with exclusion of the rest energy. This is one reason why both types of theory do not pass into one another. In Fig. 2 there is no bound state for m(Einstein) and two distinct regions, one bound and one unbound, for m(ECE). Both cases do not describe ellipses.

If it is assumed that $dr/d\theta$ describes an orbits of a precessing ellipse, the general form of orbit has to be equated by $dr/d\theta$ of elliptic orbits which has been done in Eq. (21). As a result, a particular form of function $m(r)$ is obtained, see (22). The radial part of this function is graphed in Fig. 3 for three values of eccentricity ϵ. It can be seen that these curves differ only in the region very near to the centre (note that we have set $r_0 = 1$ throughout our calculations). However these curves differ significantly from the general form of m presented in Eq. (66). This may be the reason why it was very difficult to find bound elliptic orbits in Figs. 1 and 2.

The angular dependence of m is shown in Fig. 4 in a polar diagram. For small radii, there is a significant angular variation. For radii larger than r_0 this differences become indistinguishable as can also be seen from Fig. 3. This

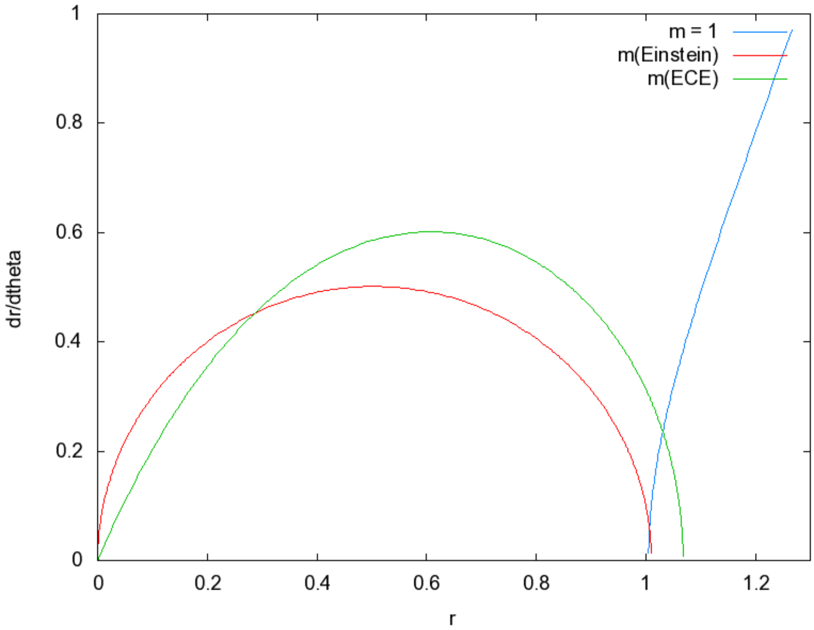

Figure 1: Bound states of $dr/d\theta$, for functions m(Einstein) and m(ECE). Parameters were $a = b = 10, R = 1, r_0 = 1$. For comparison: $m = 1$ with $a = 10, b = 1$.

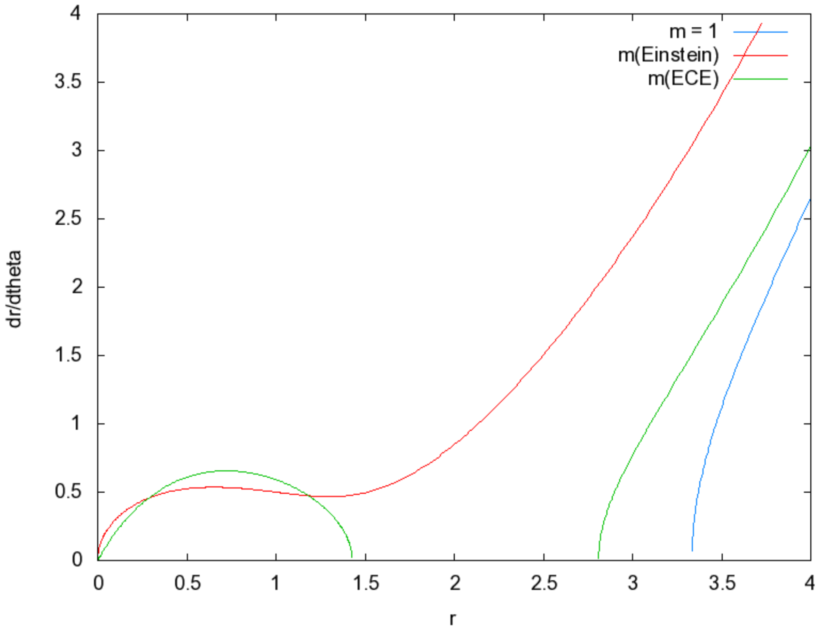

Figure 2: Unbound states of $dr/d\theta$, for functions $m = 1$, m(Einstein) and m(ECE). Parameters were $a = 2.5, b = 2, R = 1, r_0 = 1$.

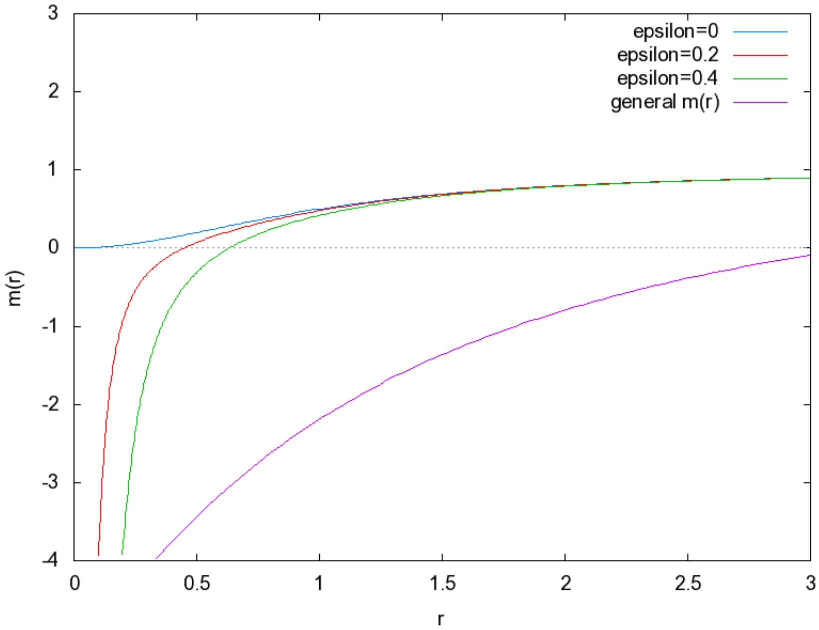

Figure 3: $m(r)$ of Eq. (22) for $a = b = x = 1$, $\theta = \pi/2$, in comparfison with $m(r)$ from Eq. (24).

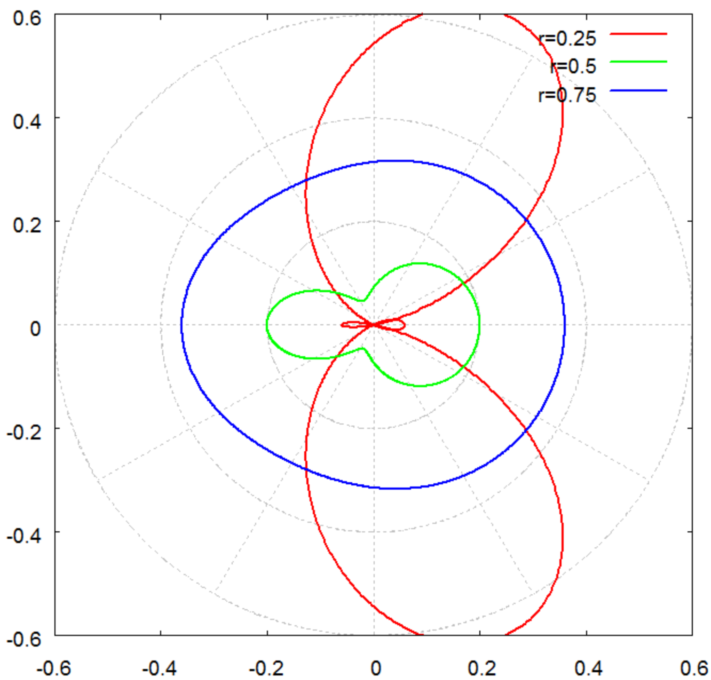

Figure 4: Angular dependence of $m(r)$ from Eq. (22) for three radius values, $\epsilon = 0.2$.

behaviour is to be expected for a spherical spacetime, there should be no angular variance, otherwise the geometry would not be spherical. The behaviour near to the center probably plays no practical role since this is inside a star where additional laws of physics are valid.

In section 2 an expression for the radial velocity of an orbiting body was derived (Eq. (15)). In the non-relativistic approximation this expression should shade into the Newtonian expression given in Eq. (26). From equating both velocity expressions (Eq. (46)), one should obtain the function m which represents the Newtonian theory. Due to the different energy definitions we do not expect a result of $m = 1$. Squaring Eq. (46) gives

$$c^2 b^2 m^2(r) \left(\frac{1}{b^2} - m(r) \left(\frac{1}{a^2} + \frac{1}{r^2} \right) \right) = \frac{2E}{m} + \frac{2MG}{r} - \frac{L^2}{m^2 r^2}. \tag{74}$$

This is a cubic equation in $m(r)$ of the form

$$c_1 m^3(r) + c_2 m^2(r) + c_3 = 0 \tag{75}$$

with constants

$$c_1 = -c^2 b^2 \left(\frac{1}{a^2} + \frac{1}{r^2} \right), \tag{76}$$

$$c_2 = c^2, \tag{77}$$

$$c_3 = -\frac{2E}{m} - \frac{2MG}{r} + \frac{L^2}{m^2 r^2}. \tag{78}$$

For consistency reasons, we write the constants L and E in terms of a and b as obtained from Eq. (67):

$$L = amc, \quad E = \frac{a}{b} mc^2. \tag{79}$$

Eq. (75) can be solved, giving two complex and one real solution. The real solution is

$$\begin{aligned} m(r) = & \left(\frac{\sqrt{c_3 \, (27 \, c_1^2 \, c_3 + 4 \, c_2^3)}}{2 \, 3^{\frac{3}{2}} \, c_1^2} - \frac{27 \, c_1^2 \, c_3 + 2 \, c_2^3}{54 \, c_1^3} \right)^{\frac{1}{3}} \\ & + \frac{c_2^2}{9 \, c_1^2 \left(\frac{\sqrt{c_3 \, (27 \, c_1^2 \, c_3 + 4 \, c_2^3)}}{2 \, 3^{\frac{3}{2}} \, c_1^2} - \frac{27 \, c_1^2 \, c_3 + 2 \, c_2^3}{54 \, c_1^3} \right)^{\frac{1}{3}}} - \frac{c_2}{3 \, c_1}. \end{aligned} \tag{80}$$

Graphing this highly complicated expression yields the results shown in Fig. 5. All tested parameter combinations give qualitatively the same curve type. The limit of m for large r is negative and not $+1$ as it should be. In particular this is not the function used by Einstein theory. This result makes evident that Newtonian and Einstein theory are not compatible.

Finally we investigated the form of $m(r)$ for a whirlpool galaxy. Equating both terms for $dr/d\theta$ as before, Eqs. (12) and (52), we obtain

$$r^2 \left(\frac{1}{b^2} - m(r) \left(\frac{1}{a^2} + \frac{1}{r^2} \right) \right)^{1/2} = \alpha r \tag{81}$$

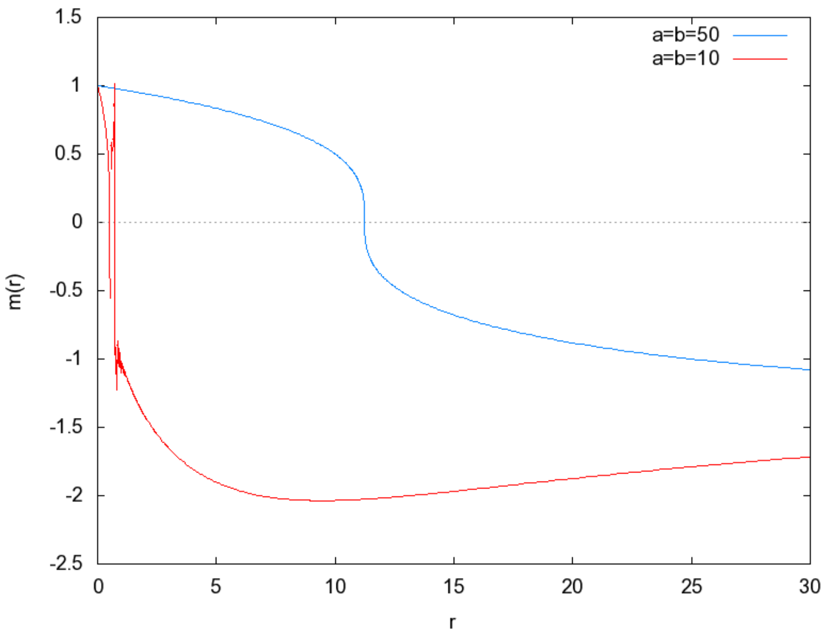

Figure 5: Newtonian limit of $m(r)$ for tow a,b parameters, other parameters being $c = 1, m = 1, M = 100, G = 1$.

or

$$m(r) = \frac{a^2}{r^2 + b^2} \left(\frac{r^2}{b^2} - \alpha^2 \right) \tag{82}$$

which has been graphed in Fig. 6. The curve is similar to the general m function, Eq. (66), for values of α between 2.5 and 3. The far field limit is unity as required but convergence behaviour is slightly different for all three curves. Compared to Fig. 3, this indicates that descibing spiral galaxies by ECE theory may even be simpler than describing elliptical orbits, a surprising result when taking into account that dark matter had to be assumed to bring Einstein theory in agreement with the experimental velocity curve. In total we have shown by numerical methods that Einstein theory is inconsistent and untenable.

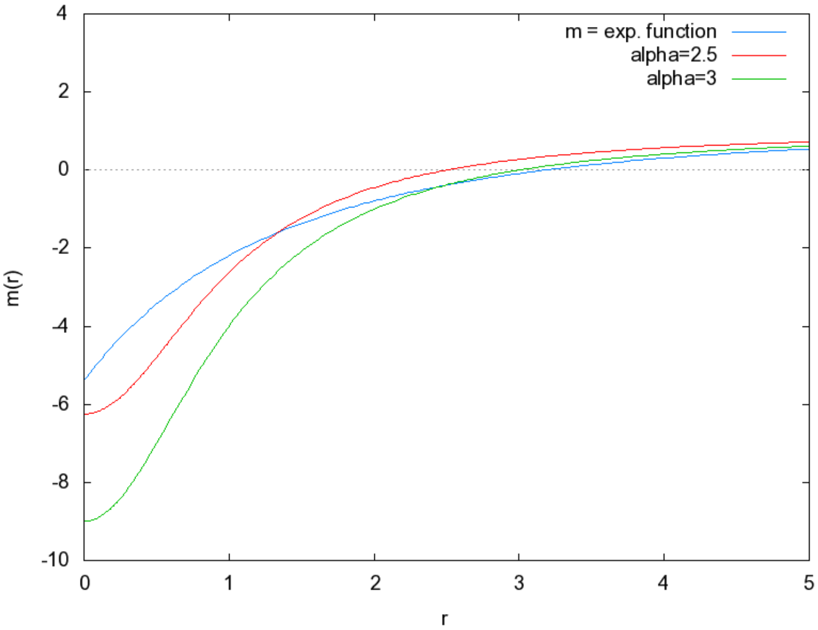

Figure 6: $m(r)$ for a spiral galaxy, with parameters $a = 1, b = 1$.

3. NUMERICAL ANALYSIS WITH MAXIMA

(Dr. Horst Eckardt's section)

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