217(4): Inter-relation between Constants for all x.

Einstein Theory

$$\theta = \frac{1}{x}\cos^{-1}\left[\left[1-\left(\frac{\alpha}{x\epsilon}\right)^2\left(\frac{1}{b^2}-\left(1-\frac{r_0}{r}\right)\left(\frac{1}{a^2}+\frac{1}{r^2}\right)\right)\right]^{1/2}\right] \quad -(1)$$

$$a = \frac{L}{mc}, \quad b = \frac{Lc}{E} \quad -(2)$$

$$r_0 = 2mG/c^2. \quad -(3)$$

Conical Section

$$\theta = \frac{1}{x}\cos^{-1}\left(\frac{1}{\epsilon}\left(\frac{\alpha}{r}-1\right)\right) \quad -(4)$$

The constants α and ϵ must be those for the precessing ellipse. These must be calculated from the Lagrangian:

$$\mathcal{L} = T - U \quad -(5)$$

where

$$T = \frac{1}{2}mv^2 = \frac{1}{2}m\left(\dot{r}^2+\dot{\theta}^2 r^2\right) \quad -(6)$$

$$U = -\frac{kx^2}{r} - \frac{k\left(1-x^2\right)\alpha}{2r^2} \quad -(7)$$

The Lagrangian theory can be summarized as:

$$\frac{d^2}{d\theta^2}\left(\frac{1}{r}\right) + \frac{1}{r} = -\frac{mr^2}{L}F(r) \quad -(8)$$

where:

$$\frac{1}{r} = \frac{1}{\alpha}\left(1+\epsilon\cos(x\theta)\right) \quad -(9)$$

2) In eq. (8):

$$L = m r^2 \dot{\theta} \quad - (10)$$

$= \text{constant of motion.}$

Eqs. (8) and (9) give:

$$F(r) = -\frac{k}{r^2}\left(x^2 + (1-x^2)\frac{\alpha}{r}\right), \quad - (11)$$

$$u(r) = -\,\partial F(r) / \partial r. \quad - (12)$$

Therefore:

$$\mathcal{L} = \frac{1}{2} m \dot{r}^2 + \frac{L^2}{2mr^2} + \frac{x^2 k}{r} + \frac{(1-x^2)\alpha k}{2r^2} \quad - (13)$$

$$= \frac{1}{2} m \dot{r}^2 + \frac{L_1^2}{2mr^2} + \frac{k_1}{r}$$

where:

$$k_1 = x^2 k \quad - (14)$$

$$L_2^2 = L^2 + m k \alpha (1-x^2) \quad - (15)$$

The Hamiltonian corresponding to eq. (13) is:

$$H = \frac{1}{2} m \dot{r}^2 + \frac{L^2}{2mr^2} - \frac{x^2 k}{r} - \frac{(1-x^2)\alpha k}{2r^2} \quad - (16)$$

and this is calculated from the as it (9). Therefore the Hamiltonian (16) gives the as it (9). The Hamiltonian is the total energy E :

$$H = E \quad - (17)$$

and E is a constant of motion. The Newtonian theory is:

$$E = \frac{1}{2} m \dot{r}^2 + \frac{L^2}{2mr^2} - \frac{k}{r} \quad - (17)$$

The structure of eq. (16) is:

$$E = \frac{1}{2} m \dot{r}^2 + \frac{L_1^2}{2mr^2} - \frac{k_1}{r} \quad - (18)$$

where

$$k_1 = x^2 k, \quad - (19)$$

$$L_1^2 = L^2 - mk\alpha(1 - x^2). \quad - (20)$$

It follows from eq. (17) that:

$$r = \frac{\alpha}{1 + \epsilon \cos\theta} \quad - (21)$$

where

$$\alpha = \frac{L^2}{mk}, \quad \epsilon = \left(1 + \frac{2EL^2}{mk^2}\right)^{1/2}, \quad - (22)$$

i.e.

$$\cos\theta = \frac{\frac{L^2}{mkr} - 1}{\left(1 + \frac{2EL^2}{mk^2}\right)^{1/2}} \quad - (23)$$

and

$$\theta(r) = \int \frac{L}{r^2} \left(2m \left(E + \frac{k}{r} - \frac{L^2}{2mr^2}\right)\right)^{-1/2} dr$$

$$- (24)$$

4) Eq. (24) comes from:

$$\frac{d\theta}{dr} = \frac{dr}{dt}\frac{dt}{d\theta}, \quad -(25)$$

$$\frac{d\theta}{dt} = \frac{L}{mr^2}. \quad -(26)$$

$$\frac{dr}{dt} = \left(\frac{2}{r}(E - U) - \frac{L^2}{m^2r^2}\right)^{1/2} \quad -(27)$$

$$U = -\frac{k}{r}. \quad -(28)$$

Eq. (18) has the same mathematical structure as eq. (17) with:

$$L \to L_1, \quad k \to k_1, \quad -(29)$$

so eqs. (24) to (28) will also have the same structure. So:

$$\theta_1(r) = \int \frac{L_1}{r^2}\left(2m\left(E + \frac{k_1}{r} - \frac{L_1^2}{2mr^2}\right)\right)^{-1/2} dr \quad -(30)$$

and

$$\theta_1 = \int \frac{xL_1}{r^2}\left(2m\left(E + \frac{k_1}{r} - \frac{L_1^2}{2mr^2}\right)\right)^{-1/2} dr \quad -(31)$$

Now rewrite eq. (31) in exactly the

5) Eq. (31) has the same structure a eq. (24), so:

$$\cos\theta_1 = \frac{1}{\epsilon_1}\left(\frac{\alpha_1}{r} - 1\right) \quad -(32)$$

i.e.

$$r = \frac{\alpha_1}{1 + \epsilon_1 \cos\theta_1} \quad -(32)$$

However, it is known that this result comes from eqs. (8) and (9), so:

$$\theta_1 = x\theta \quad -(33)$$

and in eq. (9):

$$\alpha \rightarrow \alpha_1 \quad -(34)$$

$$\epsilon \rightarrow \epsilon_1 \quad -(35)$$

so

$$\boxed{r = \frac{\alpha_1}{1 + \epsilon_1 \cos(x\theta)}} \quad -(36)$$

where:

$$\alpha_1 = \frac{L_1^2}{x^2 m^2 MG} = \frac{L_1^2}{m k_1}, \quad -(37)$$

$$\epsilon_1 = \left(1 + \frac{2EL_1^2}{m k_1^2}\right)^{1/2}, \quad -(38)$$

$$L_1^2 = L^2 - mk\alpha\left(1 - x^2\right) \quad -(39)$$

$$= x^2 L^2$$

6)

Final result:

$$\alpha_1 = \alpha \,, \quad \epsilon_1 = \epsilon \quad -(40)$$

so

$$r = \frac{\alpha}{1 + \epsilon \cos(x\theta)} \quad -(41)$$

is given by eq (7), ~~QED~~. This is a self-consistent result, so the mathematics are correct.

COMPARISON

1) The Correct Conical Section

$$\theta = \frac{1}{x} \cos^{-1}\left(\frac{1}{\epsilon}\left(\frac{\alpha}{r} - 1\right)\right) \quad -(42)$$

$$\alpha = \frac{L^2}{m^2 M G} \; ; \quad \epsilon = \left(1 + \frac{2EL^2}{m^3 M^2 G^2}\right)^{1/2} \quad -(43)$$

m = mass of planet
M = mass of sun
G = Newton constant
E = constant total energy
L = constant total angular momentum

7)

2) Einsteinian General Relativity (EGR)

$$\theta = \frac{1}{x} \cos^{-1}\left[\left[1 - \left(\frac{\alpha}{xf}\right)^2 \left(\frac{1}{b^2} - \left(1 - \frac{r_0}{r}\right)\left(\frac{1}{a^2} + \frac{1}{r^2}\right)\right)\right]^{1/2}\right]$$

$$a = \frac{L}{mc}, \quad b = \frac{Lc}{E}, \quad r_0 = \frac{2MG}{c^2} \qquad (44)$$

Valid for all x.

IT IS OBVIOUS THAT EGR IS WILDLY INCORRECT. WE NOW KNOW THAT EQ. (42) HAS A VAST RANGE OF POSSIBLE RESULTS