242(8) : True Anomaly from the Minkowski Force Equation

This is given by :

$$\theta = \sqrt{2}\,\frac{L_0}{2m}\int\frac{f(r)}{r^2}\,dr \quad -(1)$$

where $$f(r) = \left(-\int r\,\Omega^2\,dr - x\right)^{-1/2} \quad -(2)$$

and $$\Omega^2 = -\frac{L_0^2}{m^2 r^4} - \frac{F(r)}{mr} \quad -(3)$$

where $$F(r) = -\gamma^4\,\frac{mMG}{r^2} - \gamma^2\,\frac{\alpha mM}{r^3}\left(1-\gamma^2\right) \quad -(4)$$

and $$\gamma^2 = \left(1 - \frac{MG}{c^2}\left(\frac{2}{r} - \frac{1}{a}\right)\right)^{-1} \quad -(5)$$

In the Newtonian limit:

$$L_0^2 = \alpha m^2 MG \quad -(6)$$

and $$a = \frac{\alpha}{1-\epsilon^2} = \frac{mMG}{|E|} \quad -(7)$$

Here E is the conserved total energy, L_0 is the conserved total angular momentum. The Lagrangian wave equation is :

2)

$$\frac{d^2 r}{dt^2} + \Omega^2 r = 0 \quad -(8)$$

From the animation by Bernhard Foltz it is seen that the orbit must be of the form:

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

so eq. (1) must take the form of eq. (9). The perihelion precession $\Delta\theta$ can be calculated exactly from eq. (1).

The deflection of light by gravitation should also emerge from eq. (1), because it is a general equation of all orbits. As x is increased, fractal orbits should emerge. In whirlpool galaxies the features of the first animation by Bernhard Foltz should emerge, together with a velocity curve that matches the experimental data.