1) 190(10): Correct Newtonian Limits

Orbits

The orbit can be written as:

$$\frac{dr}{d\theta} = r^2\left(\frac{1}{b^2} - \left(1 - \frac{r_0}{r}\right)\left(\frac{1}{a^2} + \frac{1}{r^2}\right)\right)^{1/2} \quad -(1)$$

$$= r^2\left(\frac{1}{b^2} - \frac{1}{a^2} - \frac{1}{r^2} + \frac{r_0}{a^2 r} + \frac{r_0}{r^3}\right)^{1/2}.$$

As

$$r \to \infty \quad -(2)$$

$$\frac{dr}{d\theta} = r^2\left(\frac{1}{b^2} - \frac{1}{a^2}\right). \quad -(3)$$

This is a spiral, not a precessing ellipse.

Areal Velocity (Kepler's Second Law).

$$\frac{dA}{dt} = \frac{1}{2}\frac{c^2 L}{E}\left(1 - \frac{r_0}{r}\right) \to \frac{1}{2}\frac{c^2 L}{E} \quad -(4)$$

$$= \text{constant}.$$

Orbital Linear Velocity.

$$v = cb\left(1 - \frac{r_0}{r}\right)\left(\frac{1}{b^2} - \left(1 - \frac{r_0}{r}\right)\left(\frac{1}{a^2} + \frac{1}{r^2}\right)\right)^{1/2} \quad -(5)$$

As

$$r \to \infty$$

$$v \to cb\left(\frac{1}{b^2} - \frac{1}{a^2}\right) \quad -(6)$$

$$= \text{constant}$$

i.e the orbit goes to a circle.