263(3): Precise Derivation of Orbital Precession

Newtonian Dynamics

The condition $$\frac{d^2r}{dt^2} = 0 \quad -(1)$$

occurs at

$$r = \alpha, \quad -(2)$$

where α is the half right latitude of the ellipse illustrated in Fig (1).

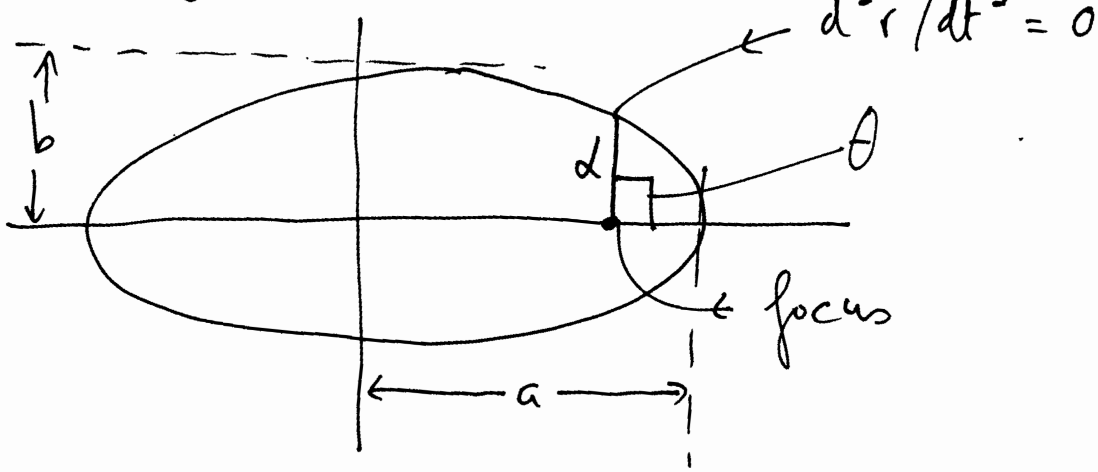


Fig (1)

In this case

$$\cos\theta = 0, \quad \theta = \frac{\pi}{2} \quad -(3)$$

Einsteinian and R Dynamics

The condition:

$$\frac{d^2r}{dt^2} = 0 \quad -(4)$$

occurs at

$$r = \alpha - r_0 \quad -(5)$$

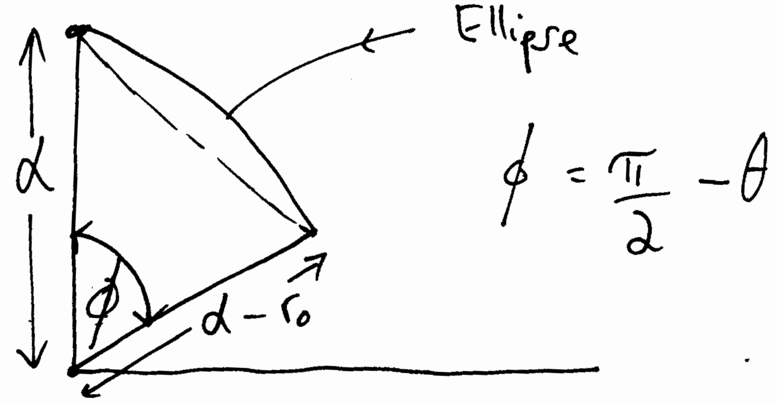
where:

2)

$$r_0 = \frac{3MG}{c^2} \quad -(6)$$

Here M is the mass at the focus of the ellipse, G is Newton's constant, c the vacuum speed of light. This is illustrated in Fig (2)

Figure 2



For small ϕ:

$$\cos\phi = \frac{\alpha - r_0}{\alpha} \quad -(7)$$

to an excellent approximation.

The Newtonian result is:

$$\phi = 0, \quad -(8)$$

and this is changed by:

$$\cos\phi = 1 - \frac{r_0}{\alpha} \quad -(9)$$

For $\phi = 0$, $\quad \cos\phi = 1 \quad -(10)$

so for clockwise precession

$$\Delta\cos\phi = -\frac{r_0}{\alpha} \quad -(11)$$

3) For anticlockwise precession:

$$\Delta \cos\phi = \frac{r_0}{\alpha} \quad -(12)$$

Using the Maclaurin series for anticlockwise precession:

$$\Delta \phi = \frac{\pi}{2} - \frac{r_0}{\alpha} + \dots \quad -(13)$$

For clockwise precession:

$$\Delta \phi = \frac{\pi}{2} + \frac{r_0}{\alpha} + \dots \quad -(14)$$

The change in angle is deduced from the fact that in the Newtonian theory the angle θ is initially $\pi/2$ as in Fig (1), and for a clockwise precession is changed by r_0/α. One can also use:

$$\theta = \frac{\pi}{2} - \phi \quad -(15)$$

where the plane polar coordinate system is (r, θ). So if ϕ is initially $\pi/2$, θ is initially 0.

For a clockwise precession:

$$\boxed{\Delta \theta = \frac{r_0}{\alpha}} \quad -(16)$$

This is exactly the experimental result per radian of orbital rotation.

4) Discussion

For one complete orbit, 2π radians are traversed, so

$$\Delta\theta = \frac{2\pi r_0}{\alpha} = \frac{6\pi MG}{c^2\alpha} \quad -(17)$$

$$= \frac{6\pi MG}{ac^2(1-\epsilon^2)}$$

because

$$\alpha = a(1-\epsilon^2) \quad -(18)$$

where a is the semi major axis and where ϵ is the eccentricity.

In the standard model this result is always interpreted as being due to the anomalous precession of planets, an anomaly that cannot be explained by Newton. As shown in UFT240 this is a very dubious procedure because the Newton theory is applied to the great majority of the observed precession, and the Einstein theory to the anomaly. Obviously the Einstein procedure should have been applied to the entire observed precession.

Leaving this aside for the sake of argument, the Einstein theory is completely incorrect geometrically, so cannot be an explanation of anything. The result (17) is also obtained by the equation

$$R = r + r_0 = \frac{\alpha}{1 + \epsilon \cos\theta} \quad -(19)$$

as in UFT 262, and the R theory is based directly on plane polar coordinates, an example of Cartan geometry in which the spin connection is the angular velocity. The distance:

$$r_0 = \frac{3MG}{c^2} \quad -(20)$$

seems to be a universal property of all planar orbits in the solar system.

The R theory gives the Coats or hyperbolic spiral of the whirlpool galaxy, but the Einstein and Newton theories fail catastrophically, as shown in the next note.