189(7): Development of $R(t)$

Consider the result:

$$m(r,t) = \frac{1}{e^2} \exp\left(2\exp\left(-\frac{r}{6R(t)}\right)\right) \quad -(1)$$

From previous work:

$$\frac{\partial m}{\partial t}(r,t) = 0 \quad -(2)$$

and r and t are independent variables, i.e. r and t are coordinate functions. R is defined as having no r dependence, but only a t dependence.

Define:

$$m(r,t) = \frac{1}{e^2} \exp(f(t)) \quad -(3)$$

then:

$$\frac{\partial m}{\partial t}(r,t) = \frac{f'(t)}{e^2} \exp(f(t)) \quad -(4)$$

where

$$f'(t) = 2\frac{\partial}{\partial t}\left(\exp\left(-\frac{r}{6R(t)}\right)\right)$$

$$= -\frac{1}{3}\left[\frac{\partial}{\partial t}\left(\frac{r}{R(t)}\right)\right]\exp\left(-\frac{r}{6R(t)}\right)$$

Therefore

$$\frac{\partial m(r,t)}{\partial t} = -\frac{1}{3e^2}\left(\frac{\partial}{\partial t}\left(\frac{r}{R(t)}\right)\right)\exp\left(-\frac{r}{3R(t)}\right)$$

$$= 0 \quad -(5)$$

In general, eq. (5) is:

2)

$$-\frac{1}{3c^2R^2(t)}\left(R(t)\frac{\partial r}{\partial t}-r\frac{\partial R}{\partial t}\right)\exp\left(-\frac{r}{3R(t)}\right)=0 \quad -(6)$$

Therefore:

$$R(t)\frac{\partial r}{\partial t}=r\frac{\partial R(t)}{\partial t} \quad -(7)$$

i.e

$$\boxed{\frac{1}{r}\frac{\partial r}{\partial t}=\frac{1}{R(t)}\frac{\partial R(t)}{\partial t}} \quad -(8)$$

The equation of orbits is therefore:

$$\boxed{\frac{\partial r}{\partial t}=\frac{r}{R(t)}\frac{\partial R(t)}{\partial t}} \quad -(9)$$

For Newtonian orbits:

$$\frac{\partial r}{\partial t}=\left(\frac{2}{\mu}(E-U)-\frac{L^2}{m^2r^2}\right)^{1/2} \quad -(10)$$

and for time delay calculations as in UFT 155, r.(9):

$$=c\left(1-\frac{r_0}{r}\right)\left(1-\left(1-\frac{r_0}{r}\right)\left(\frac{1}{a^2}+\frac{1}{r^2}\right)R_0^2\right)^{1/2}-(11)$$