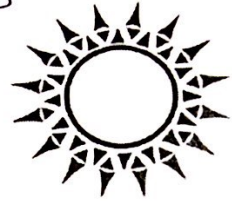


Parte E7.

23/05/2016

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Aux: Sérgio Leite



a) $U(r) = E_0 \ln(r/r_0)$

$$|V| = \sqrt{\vec{r}^2 + \vec{r}_g^2}$$

$$E_T = \frac{1}{2} m \dot{r}^2 + \underbrace{\frac{L_0^2}{2mr^2} + E_0 \ln(r/r_0)}_{U_{eff.}} \quad 0.5$$

orb. circular.

$$\frac{\partial U_{eff}}{\partial r} \stackrel{0.5}{=} 0 = \frac{E_0}{r} - \frac{L_0^2}{mr^3} \Rightarrow r^2 = \frac{L_0^2}{mE_0} \Rightarrow r_c = L_0 \sqrt{\frac{1}{mE_0}} \quad 1.0.$$

b) $\omega_{p.o} = \sqrt{\frac{U_{eff}''(r_c)}{a}}$; $U_{eff}'' = -\frac{E_0}{r^2} + \frac{3L_0^2}{mr^4} \quad 0.5$

$$U_{eff}''(r_c) = \frac{3L_0^2}{m \frac{L_0^4}{m^2 E_0^2}} - \frac{E_0}{\frac{L_0^2}{mE_0}} = \frac{3E_0^2 m}{L_0^2} - \frac{E_0^2 m}{L_0^2}$$

$$U_{eff}''(r_c) = \frac{2E_0^2 m}{L_0^2} \quad 0.5$$

$$\Rightarrow \omega_{p.o} = \sqrt{\frac{2E_0^2}{L_0^2}} = \frac{E_0}{L_0} \sqrt{2} \quad 1.0.$$

c) $r_c^2 \omega_{arc} m = L_0 \Rightarrow \frac{L_0^2}{mE_0} \cdot \omega_{arc} m = L_0 \Rightarrow \omega_{arc} = \frac{E_0}{L_0} \quad 0.5$

$$\frac{\omega_{p.o}}{\omega_{arc}} = \frac{\sqrt{2} E_0 / L_0}{E_0 / L_0} = \sqrt{2} \quad 0.5$$

Como $\omega_{p.o}/\omega_{arc} \neq 2$ a órbita não é circular. Por lo demás, dado a que $\omega_{p.o}/\omega_{arc}$ no depende de E_0 , L_0 ni m , nunca lo será.
 1.0.