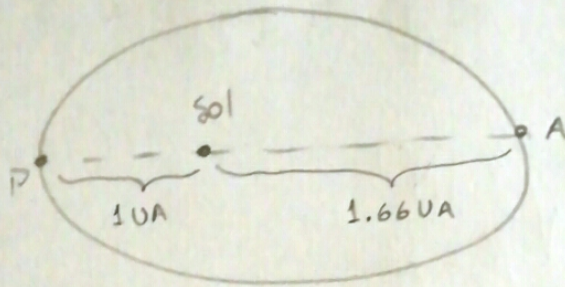


Pauta E4

P21



$$2a = (1 + 1.66) \text{ UA}$$

$$a = 1.33 \text{ UA}$$

(a) 3ª Ley de Kepler

$$T^2 = \frac{4\pi^2 a^3}{GM}$$

M masa del sol

Para la tierra

$$T_T = 1 \text{ año} \quad a_T = 1 \text{ UA} \quad \Rightarrow \quad GM = 4\pi^2$$

Para el Roadster

$$T = \sqrt{\frac{4\pi^2 a^3}{4\pi^2}} = a^{3/2}$$

$$T = (1.33)^{3/2} \text{ años}$$

(b) Por energía

$$E = \frac{m\dot{r}^2}{2} + \frac{l^2}{2mr^2} - \frac{GMm}{r}$$

En el afelio $E = E_a$, en el perihelio $E = E_p$.

$$y \quad \dot{r}_a = \dot{r}_p = 0.$$

$$\Rightarrow \frac{l^2}{2mr_a^2} - \frac{GMm}{r_a} = \frac{l^2}{2mr_p^2} - \frac{GMm}{r_p}$$

$$l = m \sqrt{\frac{2GM}{\frac{1}{r_a} + \frac{1}{r_p}}}$$

Recordamos que $l = m r_a v_a$

$$\Rightarrow \boxed{v_a = \frac{1}{r_a} \sqrt{\frac{2GM}{\frac{1}{r_a} + \frac{1}{r_p}}} \approx \frac{1}{r_a} \sqrt{\frac{8\pi^2 r_a r_p}{r_a + r_p}}}$$

$$r_a = 1.66 \text{ UA} \quad r_p = 1 \text{ UA} \quad r_a \approx \frac{3}{2}$$

$$v_a \approx \frac{2}{3} \sqrt{\frac{8 \times 9 \times \frac{3}{2}}{5/2}}$$

$$v_a \approx \frac{2}{3} \times 6 \sqrt{\frac{3}{5}} \approx 4 \frac{\text{UA}}{\text{año}}$$