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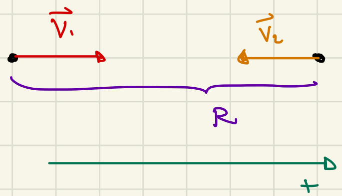

$m_1 = 4 \cdot 10^9\ kg$

$m_2 = 2m_1$

Sono a dist. molto grande = sono a dist. infinita

$R = 6{,}67 \cdot 10^3\ km$

$K_{TOT} = ?$

$V_{CM} = ?$

$V_1 = ?$

(1) $E_\infty = K_\infty + U_\infty = 0 + 0 = 0$

$E_f = K_f + U_f$

$E_\infty = E_f \rightsquigarrow 0 = E_f \qquad K_f + U_f = 0 \rightsquigarrow K_f = -U_f$

$$K_f = -\left(-G\frac{m_1 m_2}{R}\right) = G\frac{2m_1^2}{R} \approx 320\ J$$

(2) $V_{CM} = ?$ $\qquad \vec{P}_{TOT} = m_{TOT} \cdot \vec{V}_{CM}$

la qdm. si conserva. $\vec{P}_{TOT} = m_1 \vec{V}_{1,\infty} + m_2 \vec{V}_{2,\infty} = 0$

$0 = m_{TOT} \cdot \vec{V}_{CM} \Rightarrow \vec{V}_{CM} = 0$

(3) Si conserva E: $\quad E_\infty = 0 = E_f = \underbrace{\frac{1}{2}m_1 V_1^2 + \frac{1}{2}m_2 V_2^2}_{K_f} + U_f$

Si conserva qdm: $\quad P_\infty = 0 = P_f = m_1 V_1 - m_2 V_2$

So che $2m_1 = m_2$

$$\begin{cases} \cancel{m_1} V_1 = 2\cancel{m_1} V_2 \\ -U_f = \frac{1}{2}m_1 V_1^2 + \frac{1}{2}2m_1 V_2^2 \end{cases} \qquad \begin{cases} V_1 = 2V_2 \\ \frac{G\,2m_1^{\cancel{2}}}{R} = \frac{1}{\cancel{2}}\cancel{m_1} \cdot \cancel{4}^{2} V_2^2 + \cancel{m_1} V_2^2 \end{cases}$$

$$\begin{cases} V_1 = 2V_2 \;\Big]-\Big[\; V_1^2 = 4V_2^2 & \rightsquigarrow \quad V_1^2 = \frac{8}{3}\frac{G m_1}{R} \\ 3V_2^2 = \frac{2Gm_1}{R} & \rightsquigarrow \quad V_2^2 = \frac{2}{3}\frac{Gm_1}{R} \end{cases}$$

$$V_1^2 = \frac{8}{3}\cdot\frac{\cancel{6{,}67}\;10^{-11}\cdot 4\;10^{9}}{\cancel{6{,}67}\;10^{6}}\;\frac{m^2}{s^2} = \frac{32}{3}\cdot 10^{-8}\;\frac{m^2}{s^2} = 10{,}\overline{6}\cdot 10^{-8}\;\frac{m^2}{s^2}$$

$$V_1 \approx 3{,}3\cdot 10^{-4}\;\frac{m}{s}$$

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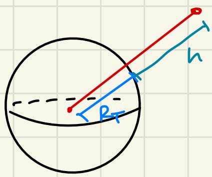

$h = 408\,km$

Quante orbite in $24\,h = d$

Se calcolo il periodo T, ho tutto.

Per la Terza legge di Keplero

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

dove a è il semiasse > dell'orbita del satellite. Ma l'orbita è circolare quindi $a = R_T + h$

$$T^2 = \frac{4\pi^2}{GM_T}\cdot(R_T+h)^3 \qquad T = 2\pi(R_T+h)\sqrt{\frac{R_T+h}{GM_T}}$$

orbite in un giorno $\frac{d}{T} = \frac{d}{2\pi(R_T+h)}\cdot\sqrt{\frac{GM_T}{R_T+h}} \approx 15$