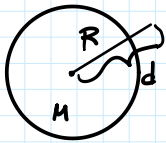


# GRAVITAZIONE

venerdì 10 marzo 2023 11:42

## ES 36



### DATI

$$M = 5,0 \cdot 10^{23} \text{ kg}$$

$$R = 3,0 \cdot 10^4 \text{ m} \text{ no atmosfera}$$

$$m = 10 \text{ kg}$$

$$K_i = 5,0 \cdot 10^7 \text{ J}$$

$$d = 4,0 \cdot 10^6 \text{ m}$$

$$K_i + U_i = K_f + U_f$$

$$K_f = K_i + U_i - U_f$$

$$U_i = -\frac{G M m}{R} \quad U_f = -\frac{G M m}{d}$$

$$K_f = 5,0 \cdot 10^7 \text{ J} - \frac{G M m}{R} + \frac{G M m}{d} = 2,2 \cdot 10^7 \text{ J}$$

$$d_{\max} = 3,0 \cdot 10^6 \text{ m}$$

In  $d_{\max}$  la sonda si ferma  $\Rightarrow K_f = 0$

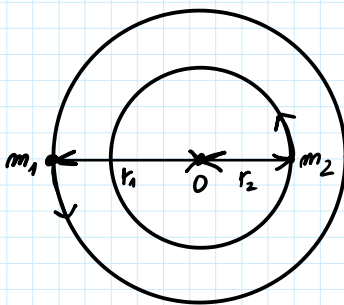
$$K_i + U_i = 0 + U_f$$

$$K_i = U_f - U_i = -\frac{G M m}{d_{\max}} + \frac{G M m}{R} = 6,9 \cdot 10^7 \text{ J}$$

$$U_i = -\frac{G M m}{R}$$

$$U_f = -\frac{G M m}{d_{\max}}$$

## ESERCIZIO 64



### DATI

$$v_{or} = 270 \text{ km/s}$$

$$T = 170 \text{ giorni}$$

$$m_1 = 6 M_s$$

$$M_s = 1,99 \cdot 10^{30} \text{ kg}$$

### INC

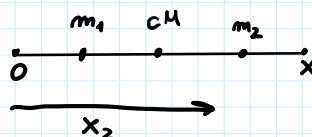
$$m_2 = ?$$

$$F = m_1 a_1$$

$$G \frac{m_1 m_2}{r^2} = m_1 \frac{v_1^2}{r_1}$$

DISTANZA  
TRA LE  
DUE STELLE

raggio orbita  
circolare



$$r_{CM} = \frac{m_1 \cdot 0 + m_2 r}{m_1 + m_2} \rightarrow r_1 = \frac{m_2}{m_1 + m_2} r$$

$$v_1 \cdot T_1 = 2\pi r_1$$

$$r = \frac{v_1 T_1}{2\pi}$$

$$V_1 \cdot T_1 = 2\pi r_1 \quad r = \frac{V_1 T_1}{2\pi}$$

$$r = \frac{m_1 + m_2}{m_2} \cdot \frac{V_1 T_1}{2\pi}$$

$$G \frac{m_1 m_2}{\left(\frac{m_1 + m_2}{m_2}\right)^2 \frac{V_1^2 T_1^2}{4\pi^2}} = m_1 \frac{V_1^2}{\frac{V_1 T_1}{2\pi}}$$

$$G \frac{m_2^3 4\pi^2}{(m_1 + m_2)^2 V_1^2 T_1^2} = \frac{2\pi m_1 V_1}{T_1}$$

$$\frac{m_2^3}{(m_1 + m_2)^2} = \frac{V_1^3 T_1}{2\pi G} = 6,90 \cdot 10^{30} \text{ kg} = 3,47 M_\odot$$

$$\frac{(\alpha M_\odot)^3}{(6M_\odot + \alpha M_\odot)^2} = \frac{\alpha^3}{(6 + \alpha)^2} = 3,47$$