Soluzione LA 1

a) $\gamma \dfrac{mM_T}{R_1^2} = m\dfrac{v_1^2}{R_1} \quad \rightarrow \quad v_1 = \left(\gamma \dfrac{M_T}{R_1}\right)^{\frac{1}{2}} \quad \rightarrow \quad T_1 = \dfrac{1}{2}\dfrac{\gamma M_T m}{R_1}$

b) $T_1 + V_1 = \dfrac{\gamma M_T m}{2R_1} - \dfrac{\gamma M_T m}{R_1} = -\dfrac{\gamma M_T m}{2R_1}$

c) $\Delta T = \dfrac{1}{16}\gamma \dfrac{M_T m}{R_1} \rightarrow T_1 + V_1 - \Delta T = T_2 + V_2 \rightarrow -\dfrac{\gamma M_T m}{2R_1} - \dfrac{1}{16}\gamma \dfrac{M_T m}{R_1} = -\dfrac{1}{2}\dfrac{\gamma M_T m}{R_2}$
$\rightarrow R_2 = \dfrac{8}{9}R_1$

Qd) $V(x,y,z) = -\alpha xyz(x^2y + xz^2 + y^2z)$

Soluzione LA 2:

a) $\gamma \frac{mM_T}{(2R_T)^2} = m\frac{v^2}{2R_T} \rightarrow v = \sqrt{\gamma \frac{M_T}{2R_T}}$

b) $\frac{1}{2}m{v_T}^2 - \frac{\gamma M_T m}{R_T} = 0 \rightarrow v_T = \sqrt{\frac{2\gamma M_T}{R_T}}$

Qd) $V(x,y,z) = -\alpha xyz(x^3 + y^3 + z^3)$

Soluzioni LA 3

a) $\gamma \dfrac{mM_T}{R_1^2} = \dfrac{mv_1^2}{R_1} \rightarrow v_1 = \sqrt{\dfrac{\gamma M_T}{R_1}} \rightarrow T = \dfrac{2\pi R_1}{v_1} = 2\pi \sqrt{\dfrac{R_1^3}{\gamma M_T}} \rightarrow T^2 \propto R_1^3$

b) $L = \dfrac{1}{2} m v_2^2 - \dfrac{\gamma m M_T}{R_2} - \dfrac{1}{2} m v_1^2 + \dfrac{\gamma m M_T}{R_1}$

$v_2 = \sqrt{\dfrac{\gamma M_T}{R_2}} \qquad L = \dfrac{1}{2} \gamma M_T m \left(\dfrac{R_2 - R_1}{R_1 R_2} \right)$

Qd) $V(x, y, z) = -\alpha x^2 y z (x^2 + y^2 + z^2)$

Soluzioni LA 4

a) $T_A = \frac{1}{2} m v_A^2$, $T_P = \frac{1}{2} m v_P^2 \rightarrow v_P^2 = 4 v_A^2 \rightarrow v_P = 2 v_A$

b) $m v_A r_A = m v_P r_p \rightarrow r_A = 2 r_P$

c) E = costante $\rightarrow \frac{1}{2} m v_P^2 - \frac{\gamma m M_T}{r_P} = \frac{1}{2} m v_A^2 - \frac{\gamma m M_T}{r_A}$

$\rightarrow \frac{1}{2} m v_P^2 - \frac{1}{2} m v_A^2 = \gamma m M_T \left(\frac{1}{r_p} - \frac{1}{r_A} \right) \rightarrow \frac{3}{2} m v_A^2 = \gamma m M_T \left(\frac{r_A - r_P}{r_p r_A} \right) \rightarrow v_A^2 = \frac{2}{3} \frac{\gamma M_T}{r_A}$

Qd) $V(x,y,z) = -\alpha x y z (x + y + z)$