

$L = I\omega_0 = \frac{m_1 r^2}{2} \omega_0 = L_1 = \frac{m_1 r^2}{2} \omega + m_2 r^2 \omega$   
 $\frac{m_1 r^2 \omega_0}{2} = r^2 \omega \left( \frac{m_1}{2} + m_2 \right) \quad \omega = \frac{m_1 \omega_0}{m_1 + 2m_2} = \frac{3}{12} \frac{\text{rad}}{\text{s}} = 4.5 \frac{\text{rad}}{\text{s}}$

$m_2 v = (m_1 + m_2) v_{cm} \quad v_{cm} = \frac{m_2}{m_1 + m_2} v \quad r_{cm} = \frac{x m_1 / 2}{m_1 + m_2}$   
 $(x - r_{cm}) m_2 v = I \omega = \left( \frac{m_1 l^2}{12} + r_{cm}^2 m_1 + m_2 (x - r_{cm})^2 \right) \omega \quad \omega = \frac{(x - r_{cm}) m_2 v}{I}$   
 $\omega = \frac{r v}{\frac{l^2}{12} + x^2}$   
 $J = \Delta P = m \omega r - m v$

$J_x = \Delta P_x = -m_2 v$   
 $I \omega = I' \omega' \quad \frac{m_1 l^2}{12} \omega = \left( \frac{m_1 l^2}{12} + \frac{m_2 l^2}{4} \right) \omega' \quad \omega' = \frac{m_1 \omega}{m_1 + 3m_2}$   
 $J_y = \Delta P_y = \frac{1}{2} m_2 \omega' \frac{l}{2} \quad J = \sqrt{J_x^2 + J_y^2} \quad \theta = \arcsin \frac{J_y}{J}$

$L \omega = I \omega' \quad \frac{1}{2} m_1 R^2 \omega = \left( \frac{1}{2} m_1 R^2 + m_2 d^2 \right) \omega' \quad \omega' = \frac{m_1 R^2 \omega}{m_1 R^2 + 2m_2 d^2}$   
 $J_y = m_2 \sqrt{g h} \quad \text{Impulso angular} = J_{\text{ol}}$

$m v = 2 M v_{cm} \quad v_{cm} = \frac{v}{2}$   
 $L_f = 0 \Rightarrow \frac{1}{2} R m v = \frac{m R^2 \omega}{2} \quad \omega = \frac{v \sin \theta}{R} \quad \omega = \frac{v}{R}$   
 $\text{Pole: } 0 \quad L_i = R m v \sin \theta - I \omega = \frac{1}{2} R m v - \frac{1}{2} m R^2 \omega$   
 $2 R \sin \theta = R \quad \sin \theta = \frac{1}{2} \quad \theta = \frac{\pi}{6}$

$\frac{G M}{R^2} = \frac{v^2}{R} \quad T = \frac{2\pi R}{v} \quad T^2 = \frac{4\pi^2 R^3}{v^2} = \frac{4\pi^2}{G M} R^3$   
 $P = m v_{cm} = 0 \quad L = 3 R m v$   
 $\frac{M v^2}{R} = \frac{G M m}{R^2} + \frac{2 G m^2}{(2 R \sin \frac{\pi}{3})^2} = \frac{G M m}{R^2} + \frac{2 G m^2}{3 R^2} \quad v = \sqrt{\frac{G}{R} \left( M + \frac{2}{3} m \right)}$   
 $T = \frac{2\pi R}{v}$   
 $\frac{1}{M} = \frac{1}{M} + \frac{2}{3m} = \frac{m+2M}{3Mm} \quad M = \frac{Mm}{m+3M} \quad E_p = 3 \frac{G M m}{R} \quad E_k = \frac{6 m v^2}{2 R \sqrt{3}}$