

Recitation Week 9

Ch. 9 #80



$$PE = mgR$$

$$KE_f = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$$

$$\omega = v/R \Rightarrow v = \omega R$$

$$I = \frac{1}{2}mR^2$$

$$PE = KE_f$$

$$mgR = \frac{1}{2}m(\omega R)^2 + \frac{1}{2}\left(\frac{1}{2}mR^2\right)\omega^2$$

$$g = \frac{1}{2}\omega^2 R + \frac{1}{4}\omega^2 R$$

$$\omega^2 \left(\frac{1}{2}R + \frac{1}{4}R\right) = g$$

$$\omega^2 = \frac{4g}{3R}$$

$$\boxed{\omega = \sqrt{\frac{4g}{3R}}}$$

Ch. 9 #86

$$E_o = m_1gh$$

$$E_f = m_2gh + \frac{1}{2}m_1v^2 + \frac{1}{2}m_2v^2 + \frac{1}{2}I\omega^2$$

$$\omega = v/R$$

$$m_1gh = m_2gh + \frac{1}{2}(m_1+m_2)v^2 + \frac{1}{2}I\left(\frac{v}{R}\right)^2$$

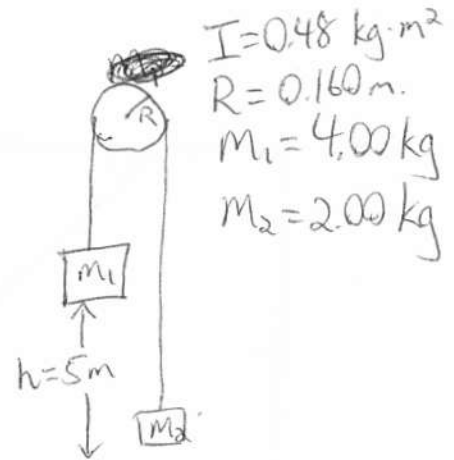
$$4(9.8)5 = 2(9.8)5 + \frac{1}{2}(4+2)v^2 + \frac{1}{2}(0.48)\left(\frac{1}{0.16}\right)^2v^2$$

$$196 = 98 + 3v^2 + 9.375v^2$$

$$12.375v^2 = 98$$

$$v^2 = 7.92$$

$$v = 2.81 \text{ m/s}$$



Ch. 9 #92

$$E_o = m_bgh$$

$$E_f = \frac{1}{2}I_c\omega_c^2 + \frac{1}{2}I_p\omega_p^2 + \frac{1}{2}m_bv^2$$

$$\omega_c = v/R_c \quad \omega_p = v/R_p$$

$$m_bgh = \frac{1}{2}\left(\frac{1}{2}m_cR_c^2\right)\left(\frac{v}{R_c}\right)^2 + \frac{1}{2}\left(\frac{1}{2}m_pR_p^2\right)\left(\frac{v}{R_p}\right)^2 + \frac{1}{2}m_bv^2$$

$$m_bgh = \frac{1}{4}m_cv^2 + \frac{1}{4}m_pv^2 + \frac{1}{2}m_bv^2$$

$$v^2 = \frac{m_bgh}{\frac{1}{4}m_c + \frac{1}{4}m_p + \frac{1}{2}m_b}$$

$$v^2 = \frac{3(9.8)(1.5)}{\frac{1}{4}(5) + \frac{1}{4}(2) + \frac{1}{2}(3)}$$

$$v^2 = \frac{44.1}{3.25} = 13.57$$

$$v = 3.68 \text{ m/s}$$

