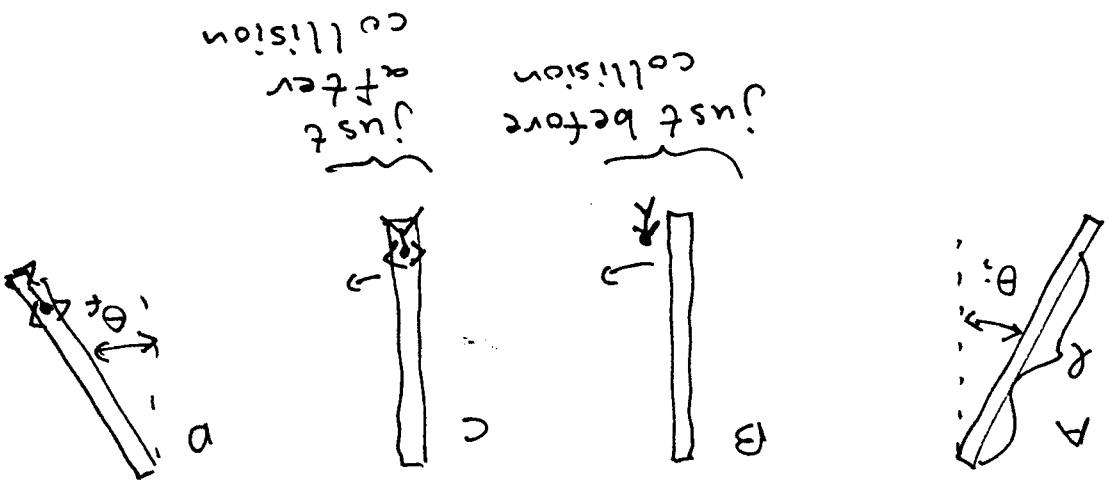


Problem 1



$$E_A = E_B$$

$$Mg \frac{r}{2} (1 - \cos \theta_i) = \frac{1}{2} I \omega^2$$

$$= \frac{1}{2} \left(\frac{1}{3} M r^2 \right) \omega^2$$

$$\omega^2 = \frac{3g}{r} (1 - \cos \theta_i)$$

$$\omega_B = 1.1 \text{ rad/s}$$

$$L_B = L_C \quad (\text{inelastic collision})$$

$$I \omega_B = (I + m r^2) \omega_C$$

total I

$$\frac{1}{3} M r \omega_B = \left(\frac{1}{3} M + m \right) r \omega_C$$

$$\omega_C = \frac{\frac{1}{3} M}{\frac{1}{3} M + m} \omega_B$$

$$\omega_C = 0.14 \text{ rad/s}$$

Midterm 3