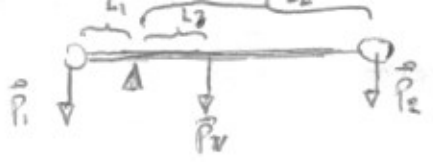
① 

Calculamos el momento de inercia del sistema, teniendo que $I = I_V + I_1 + I_2$

Usando el teorema de los ejes paralelos, para I_V tenemos:

$$I_V = I_{cm} + ML_3^2 = \frac{1}{12}M(L_1+L_2)^2 + ML_3^2$$

$$I_V = \frac{1}{12}M(1m)^2 + M(0,3m)^2 = M(0,17m^2)$$

$$I_1 = ML_1^2 = M(0,2m)^2 = M(0,04m^2)$$
$$I_2 = ML_2^2 = M(0,8m)^2 = M(0,64m^2)$$ (1 pto)

$$I = M(0,17m^2) + M(0,04m^2) + M(0,64m^2) = M(0,85m^2)$$ (1 pto)

Aplicamos ahora 2da ley de Newton:

$$\sum \tau_z = I\alpha_z$$

$$L_2|\vec{P}_2|\sin 90^\circ + L_3|\vec{P}_v|\sin 90^\circ - L_1|\vec{P}_1|\sin 90^\circ = I\alpha_z$$

$$L_2Mg + L_3Mg - L_1Mg = M(0,85m^2)\alpha_z$$

$$\alpha_z = \frac{g(L_2+L_3-L_1)}{(0,85m^2)} = \frac{(9,8m/s^2)(0,8m+0,3m-0,2m)}{(0,85m^2)} = 10,37\,rad/s^2$$ (2 pts)

$$|\vec{a}_1| = \alpha_z L_1 = (10,37\,m/s^2)(0,2m) = 2,07\,m/s^2$$
$$|\vec{a}_2| = \alpha_z L_2 = (10,37\,rad/s^2)(0,8m) = 8,29\,m/s^2$$ (1 pto)

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② 

Conservación del momento angular:

$$L_{iz} = L_{zf}$$

$$I_dW_i = (I_d + I_m)W_f$$

$$\left(\frac{1}{2}MR^2\right)W_i = \left(\frac{1}{2}MR^2 + MR^2\right)W_f$$

$$MW_i = (M+2m)W_f$$

$$W_f = \left(\frac{M}{M+2m}\right)W_i$$ (2 pts)

$$K_i = \frac{1}{2}I_dW_i^2 = \frac{1}{2}\left(\frac{1}{2}MR^2\right)W_i^2 = \frac{1}{4}MR^2W_i^2$$ (1 pto)

$$K_f = \frac{1}{2}(I_d+I_m)W_f^2$$

$$K_f = \frac{1}{2}\left(\frac{1}{2}MR^2 + MR^2\right)\left(\frac{M}{M+2m}\right)^2 W_i^2$$

$$K_f = \frac{R^2}{4}(M+2m)\frac{M^2}{(M+2m)^2}W_i^2$$

$$K_f = \frac{1}{4}\frac{M^2R^2}{(M+2m)}W_i^2$$ (1 pto)

$$\Delta K = K_f - K_i = \frac{1}{4}\frac{M^2R^2}{(M+2m)}W_i^2 - \frac{1}{4}MR^2W_i^2$$

$$\Delta K = \frac{1}{4}\left[\frac{M}{M+2m} - 1\right]MR^2W_i^2 = \frac{1}{4}\left[\frac{M-M-2m}{M+2m}\right]MR^2W_i^2$$

$$\Delta K = -\frac{1}{2}\left(\frac{mM}{M+2m}\right)R^2W_i^2$$ (1 pto)