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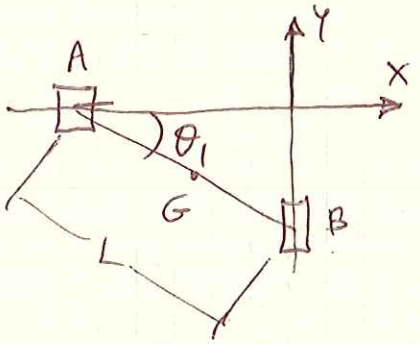
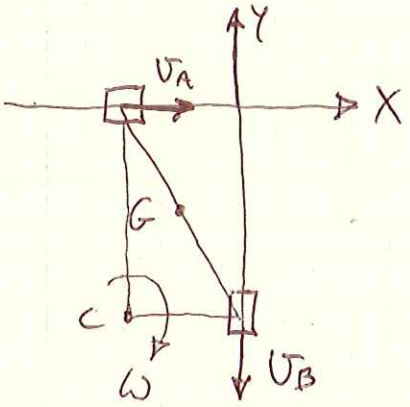
$M = 10^{kg}$, $v_1 = 0$, $\theta_1 = 30°$, $\theta_2 = 60°$,

FIND v_A AND v_B

POSITION 1



POSITION 2



CONSERVATION OF ENERGY:

$$T_1 + V_1 = T_2 + V_2$$

$$V_1 = V_g = -Wh_1 = -mg\left(\frac{L}{2}\right)\sin\theta_1$$

$$T_1 = 0$$

$$V_2 = V_g = -mg\left(\frac{L}{2}\right)\sin\theta_2$$

$$T_2 = \frac{1}{2}m\bar{v}^2 + \frac{1}{2}\bar{I}\omega^2$$

$$\bar{v} = r\omega = \frac{1}{2}L\omega \quad , \quad \bar{I} = \frac{1}{12}mL^2$$

$$T_2 = \frac{1}{2}m\left(\frac{1}{2}L\omega\right)^2 + \frac{1}{2}\left(\frac{1}{12}mL^2\right)\omega^2$$

$$T_2 = mL^2\omega^2\left(\frac{1}{8} + \frac{1}{24}\right) = \frac{1}{6}mL^2\omega^2$$

$$0 - \frac{1}{2}mgL\sin\theta_1 = \frac{1}{6}mL^2\omega^2 - \frac{1}{2}mgL\sin\theta_2$$

$$\omega = \sqrt{\frac{6}{mL^2}\left(\frac{1}{2}mgL\sin\theta_2 - \frac{1}{2}mgL\sin\theta_1\right)}$$

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$$\omega = \sqrt{\left(\frac{3g}{L}\right)(\sin\theta_2 - \sin\theta_1)}$$

$$\omega = \sqrt{\frac{3\left(9.81\ \frac{m}{s^2}\right)}{(1.2\ m)}\cdot(\sin 60^\circ - \sin 30^\circ)} = 2.996\ \frac{RAD}{s}$$

$$\vec{v}_A = (L\sin\theta_2\,\omega)\,\hat{i} = \left[(1.2\ m)(\sin 60^\circ)\left(2.996\ \frac{RAD}{s}\right)\right]\hat{i}$$

$$\boxed{\vec{v}_A = (3.114)\,\hat{i}\ \frac{m}{s}}$$

$$\vec{v}_B = (-L\cos 60^\circ\,\omega)\,\hat{j} = \left[-(1.2\ m)(\cos 60^\circ)\left(2.996\ \frac{RAD}{s}\right)\right]\hat{j}$$

$$\boxed{\vec{v}_B = (-1.798)\,\hat{j}\ \frac{m}{s}}$$