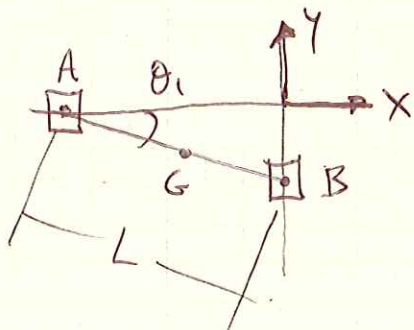


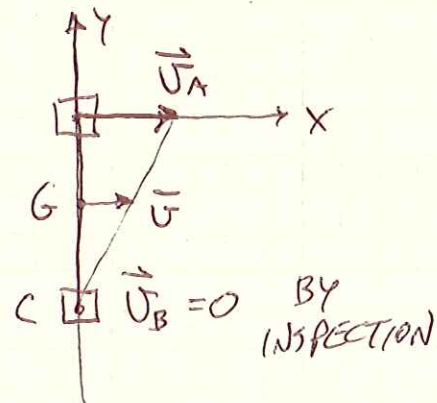
PROB. 17-37

$m = 10 \text{ kg}$, $v_i = 0$, $\theta_1 = 20^\circ$, $\theta_2 = 90^\circ$, FIND v_A , v_B

POSITION 1



POSITION 2



CONSERVATION OF ENERGY:

$$T_1 + V_1 = T_2 + V_2$$

$$T_1 = 0, \quad V_1 = V_g = -Wh_1 = -mg\left(\frac{L}{2} \sin \theta_1\right)$$

$$V_2 = -Wh_2 = -mg\left(\frac{L}{2}\right)$$

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

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

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

$$T_2 = \frac{1}{8} m v_A^2 + \frac{1}{24} m v_A^2 = \frac{1}{6} m v_A^2$$

$$0 - mg\left(\frac{L}{2} \sin \theta_1\right) = \frac{1}{6} m v_A^2 - mg\left(\frac{L}{2}\right)$$

$$v_A = \sqrt{\frac{6}{m} \left(\frac{1}{2} mgL - \frac{1}{2} mgL \sin \theta_1\right)} = \sqrt{3gL(1 - \sin \theta_1)}$$

$$v_A = \sqrt{3 \left(9.81 \frac{\text{m}}{\text{s}^2}\right) (1.2 \text{ m}) (1 - \sin 20^\circ)} = 4.820 \frac{\text{m}}{\text{s}} \rightarrow$$

$$v_B = 0$$