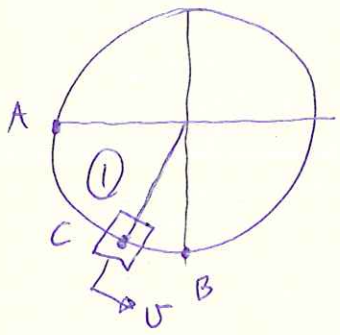
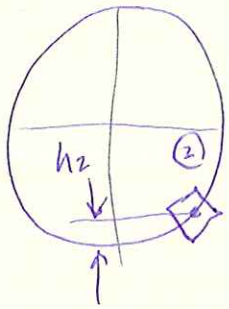
PROB. 13-64

$K = 3 \frac{LB}{ft}$, $l_u = S_{AB}$, $W = (8^{OZ})\left(\frac{LB}{16^{OZ}}\right) = 0.5^{LB}$, $R = 12^{IN} = 1\,ft$

$V_1 = 0$ @ $\theta = 30°$

a) FIND $h_2$




UNDEFORMED LENGTH:

$l_u = \frac{\pi}{2} R = \frac{\pi}{2}\,ft$

$T_1 + V_1 = T_2 + V_2$

$T_1 + (V_e)_1 + (V_g)_1 = T_2 + (V_e)_2 + (V_g)_2$

AT POINT 1: DEFLECTION FROM UNDEFORMED LENGTH

$\Delta x = (30°)\left(\frac{\pi}{180°}\right) R = \frac{\pi}{6}\,ft$

HEIGHT ABOVE B: $h_1 = 1 - 1 \cdot \cos 30° = 0.1340\,ft$

$V_1 = 0 \therefore T_1 = 0$, $(V_e)_1 = \frac{1}{2} K \Delta x^2$, $(V_g)_1 = W h_1$

AT POINT 2:

$V_2 = 0 \therefore T_2 = 0$, $(V_e)_2 = 0$, $(V_g)_2 = W h_2$

$0 + \frac{1}{2} K \Delta x^2 + W h_1 = 0 + 0 + W h_2$

$h_2 = \frac{1}{W}\left(\frac{1}{2} K \Delta x^2 + W h_1\right) = h_1 + \frac{K \Delta x^2}{2W}$

$h_2 = (0.1340\,ft) + \frac{\left(3 \frac{LB}{ft}\right)\left(\frac{\pi}{6}\,ft\right)^2}{2(0.5^{LB})}$ $= 0.9565\,ft$

b) FIND $V_{max}$: OCCURS AT B

$T_2 = \frac{1}{2} M V_2^2 = \frac{1}{2} \frac{W}{g} V_2^2$, $(V_e)_2 = 0$, $(V_g)_2 = 0$

PROB. 13-64 CONT.

$$0 + \frac{1}{2}K\Delta x^2 + Wh_1 = \frac{1}{2}\frac{W}{g}v_2^2 + 0 + 0$$

$$v_2 = \sqrt{\frac{2g}{W}\left(\frac{1}{2}K\Delta x^2 + Wh_1\right)}$$

$$v_2 = \sqrt{\frac{2\left(32.2\ \frac{ft}{s^2}\right)}{(0.5\ lb)}\cdot\left[\frac{1}{2}\left(3\ \frac{lb}{ft}\right)\left(\frac{\pi}{6}\ ft\right)^2 + (0.5\ lb)(0.134\ ft)\right]}$$

$$\boxed{v_2 = 7.848\ \frac{ft}{s}}$$