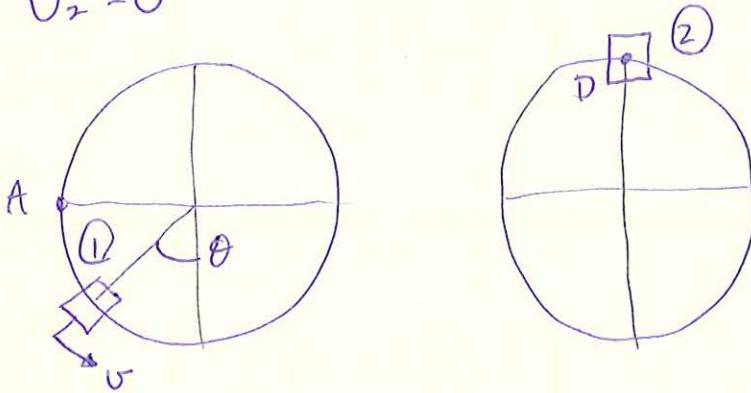


PROB. 13-65

$$K = 3 \frac{\text{LB}}{\text{ft}}, \quad W = 8^{0.2} = 0.5 \text{ LB}, \quad V_1 = 0 @ \theta, \quad R = 12'' = 1 \text{ ft}$$

a) FIND θ_{\min} FOR COLLAR TO PASS THROUGH POINT D:

$$V_2 = 0$$



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

POINT 1: SPRING DEFLECTION: $\Delta X = \theta R = \theta \text{ ft}$

$$h_1 = R - R \cos \theta = (1 - \cos \theta) \text{ ft}$$

$$T_1 = 0, \quad (V_e)_1 = \frac{1}{2} K \Delta X^2 = \frac{1}{2} K \theta^2, \quad (V_g)_1 = W(1 - \cos \theta)$$

POINT 2: $V_2 = 0, \quad h_2 = 2R = 2 \text{ ft}$

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

$$0 + \frac{1}{2} K \theta^2 + W(1 - \cos \theta) = 0 + 0 + W h_2$$

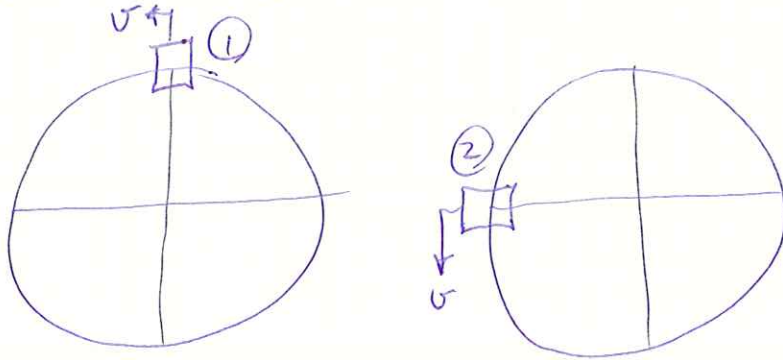
$$\frac{1}{2} K \theta^2 + W(1 - \cos \theta) - W h_2 = 0$$

$$\frac{3}{2} \theta^2 + \frac{1}{2} (1 - \cos \theta) - 1 = 0 \quad \text{SOLVE USING GOAL SEEK}$$

$$\theta = (0.7584 \text{ RAD}) \left(\frac{180^\circ}{\pi} \right) = 43.45^\circ$$

PROB. 13-65 CONT.

b) FIND U_A



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

AT POINT 1: $U_1 = 0 \therefore T_1 = 0, (V_g)_1 = WR$

AT POINT 2: $T_2 = \frac{1}{2} m U_2^2 = \frac{1}{2} \frac{W}{g} U_2^2, (V_g)_2 = 0$

$$0 + WR = \frac{1}{2} \frac{W}{g} U_2^2 + 0$$

$$U_2 = \sqrt{2gR}$$

$$U_2 = \sqrt{2(32.2 \frac{ft}{s^2})(1 ft)} = 8.025 \frac{ft}{s}$$