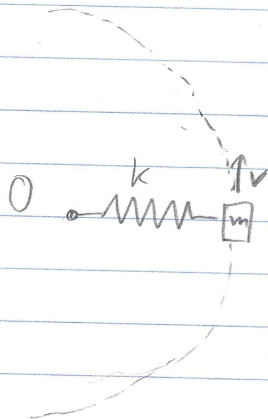20-P-MOM-DY-43

A $m = 10kg$ mass is tethered to a center pole via a spring with the spring constant $k = 10$ N/m. Determine the steady state velocity of the mass. $r_1 = 0.5m$

$$V_1 = 2 m/s$$

Solution: $H_1 + \Sigma \int M dt = H_2$

$$r_1 m v_1 + \Sigma \int M dt = r_2 m v_2$$

$$\overset{V'}{\underset{0}{}}$$

$$r_2 m v_2 - r_1 m v_1 = 0 \qquad r_2 = \frac{r_1 v_1}{v_2}$$

$$\Sigma F_r: \qquad k(\Delta r) = ma_c = m\frac{v_2^2}{r_2}$$

$$k(r_2 - r_1) = m\frac{v_2^2}{r_2}$$

$$k\left(\frac{1}{v_2} - 0.5\right) = m v_2^3$$

$$m v_2^4 + 0.5 v_2 - k = 0 \qquad \underline{V_2 = 0.987 \, m/s}$$

$$\overset{}{\underset{k}{\uparrow}}$$

$$0.86742$$

$$k\left(\frac{r_1 v_1}{v_2} - r_1\right) = m\frac{v_2^3}{r_1 v_1}$$

$$\frac{m v_2^4}{r_1 v_1} - k r_1 v_1 + k r_1 v_2 = 0$$