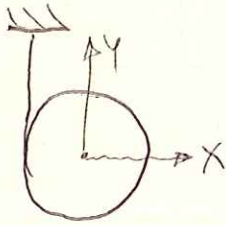


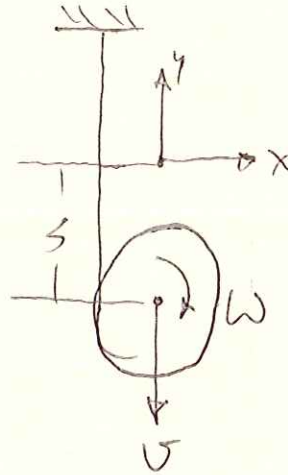
PROB. 17-25

CYLINDER, RADIUS  $r$ , MASS  $m$ ,  $\omega_0 = 0$ ,  
FIND  $v$  AFTER DISTANCE  $s$

POSITION 1



POSITION 2



CONSERVATION OF ENERGY:

$$T_1 + V_1 = T_2 + V_2$$

$$T_1 = 0, V_1 = 0$$

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

$$V_2 = V_e = -W s = -m g s$$

$$0 = \frac{1}{2} m \bar{v}^2 + \frac{1}{2} \bar{I} \omega^2 - m g s$$

$$\bar{v} = r \omega, \bar{I} = \frac{1}{2} m r^2$$

$$0 = \frac{1}{2} m (r \omega)^2 + \frac{1}{2} \left( \frac{1}{2} m r^2 \right) \omega^2 - m g s$$

$$0 = \frac{3}{4} m r \omega^2 - m g s$$

$$\omega = \sqrt{\frac{4 g s}{3 r^2}}$$

$$v = r \omega = \sqrt{\frac{4 g s}{3}} \quad \downarrow$$