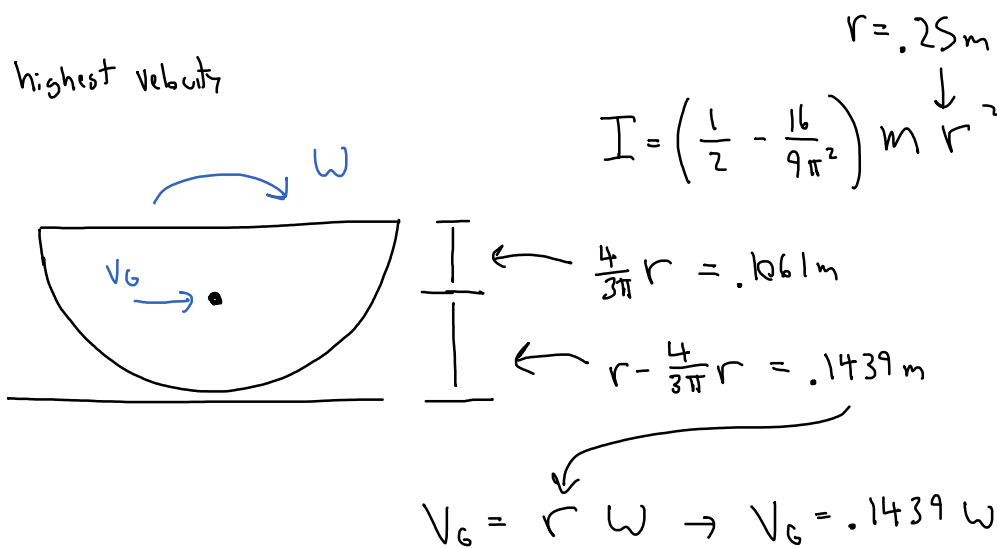


Problem 4

A 16 kg half cylinder is placed on a hard, flat surface as shown below and released from rest. What will the maximum angular velocity be as it rocks back and forth?



at highest velocity



$$I = \left(\frac{1}{2} - \frac{16}{9\pi^2} \right) m r^2 = .3199 \text{ kg m}^2$$

$$W = \Delta KE - \Delta PE$$

$$0 = \frac{1}{2} m v_G^2 + \frac{1}{2} I \omega^2 + m g \Delta h$$

$$0 = \frac{1}{2} (16) (.1439 \omega)^2 + \frac{1}{2} (.3199) \omega^2 + (16)(9.81)(.1439 - .25)$$

$$0 = .16565 \omega^2 + .1599 \omega^2 - 16.654 \rightarrow \boxed{\omega = 51.15 \text{ rad/s}}$$