Problem 3

A 5 kg spherical ball with a radius of .05m as shown below is placed on a ramp. If the ball rolls without slipping, what is the velocity of the ball at the bottom of the ramp?

\[ W = \Delta KE + \Delta PE \]

\[ \mathcal{O} = \frac{1}{2} I \omega^2 + \frac{1}{2} m v_c^2 + my \Delta h \]

Rolling without slipping:

\[ v = -r \omega \Rightarrow \omega = \frac{v}{r} \]

\[ \mathcal{O} = \frac{1}{2} \left( \frac{2}{5} (Sh_b)(.05m)^2 \right) \left( \frac{-v}{.05} \right)^2 + \frac{1}{2} (Sh_b) V^2 + (Sh_b)(9.81 \frac{m}{s^2})(-.1m) \]

\[ Q = V^2 + 2.5 V^2 - 4.905 \]

\[ \sqrt{V} = 1.18 \text{ m/s} \]