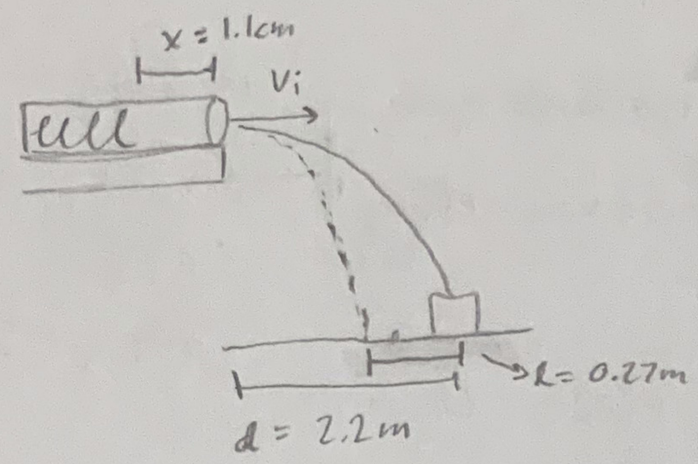
Physics Final

Jacob Dill

9.)



distance needed = 1.93m

$\Delta d = v_i t$

$2.2 = v_{i_1} t$

$1.93 = v_{i_2} t$

$\frac{1.93}{v_{i_2}} = t$

t is same since y acceleration is a constant

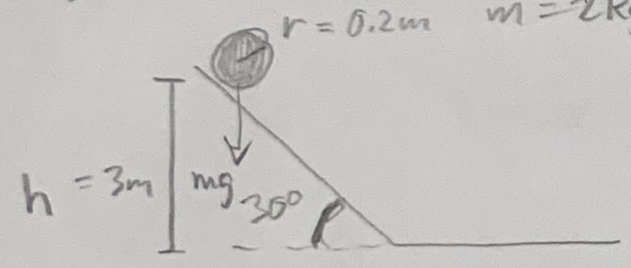
$2.2 = \frac{v_{i_1}}{v_{i_2}} 1.93$

X Velocity directly propotional to distance of spring

$\frac{0.011}{x_2} 1.93 = 2.2$

$\frac{0.02123}{x_2} = 2.2$ $\quad 0.00965\,m$

10.)



$I = \frac{1}{2} mr^2$

a.) $E_f = E_{translational} + E_{rotational} = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2$ $\quad \omega = \frac{v}{r}$

$E_i = mgh = (2)(10)(3) = 60\,J$

$60 = \frac{1}{2}mv^2 + \frac{1}{2}I\omega^2 = \frac{1}{2}mv^2 + \frac{1}{2}\left(\frac{1}{2}mr^2\right)\frac{v^2}{r^2}$

$60 = \frac{1}{2}mv^2 + \frac{1}{4}mv^2 = \frac{3}{4}mv^2$

$80 = mv^2$

b.) $KE_{rotation} = \frac{1}{2}I\omega^2 = \frac{1}{2}\left(\frac{1}{2}mr^2\right)\frac{v^2}{r^2} = \frac{1}{4}mv^2$

$mgh - \frac{1}{2}mv^2 = \frac{1}{4}mv^2 \Rightarrow 80 = mv^2$ $\quad v^2 = 40$ $\quad v = \boxed{6.32\ m/s}$

from previous problem