20-P-MOM-DY-25

A $m = 2\,kg$ ball, that is attached to a cord, travels around on top of a frictionless disk with a hole in the middle. The ball travels in a path that can be described as a circle with radius $r = 2\,m$ with a constant speed $v_1 = 2\ m/s$. If the cord begins at rest and then is pulled downward through a hole with constant velocity $v_c = 0.2\ m/s$, determine the velocity of the ball at time $t = 4s$. Determine the work done by the cord.

$r = 2 - v_c t = 1.2\,m$

$H_1 = H_2$

$m v_{r_1} = m v_{r_2}$ $\quad (2)(2) = v_2 (1.2)$ $\quad v_2 = 3.33\ m/s$

$v_f = 3.334\ m/s$

$T_1 + \sum U_{1-2} = T_2$

$\frac{1}{2} m v_i^2 + w = \frac{1}{2} m v_f^2$

$v_i = \sqrt{2^2 + 0.2^2} = 2.01\ m/s$

$w = 7.109\ J$