HW6-4 Soln)

This isn't as bad as the previous example. The force of the hand is always in the direction of motion of the ball.

$$W_{TOTAL} = \Delta K + \Delta U$$

$W_{Hand} = \int F\cos\theta\, dl = F\cos\theta \int dl = F\cos\theta\, l = F\cos\theta\, \pi r = 30(\cos(0))\pi(0.6) = 56.5\ J$.

Wg = conservative

Then,

$$W_{NC} = \Delta K + \Delta U$$

$$W_{Hand} = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 + gmy_f - gmy_i$$

Set lowest point as y=0

$y_i = 2r = 1.2$ m

$$W_{Hand} = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2 - gmy_i$$

$$v_f = \sqrt{\frac{2\left(W_{Hand} + \frac{1}{2}mv_i^2 + gmy_i\right)}{m}} = \sqrt{\frac{2\left(56.5 + \frac{1}{2}0.35(12^2) + 10(0.35)1.2\right)}{0.35}} = 22.2\ m/s$$