Assignment 9

7.1 $v_0 = 4.0\ m/s$

$v_f = -21\ m/s$

$m = 0.35$

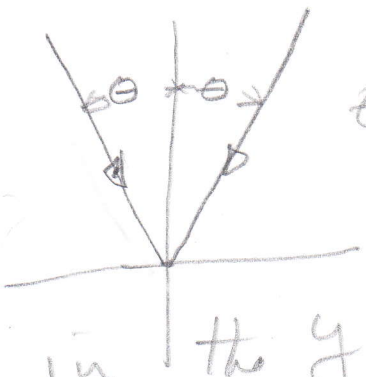
Impulse $= \vec{J} = m\vec{v_f} - m\vec{v_0} = m(\vec{v_f} - \vec{v_0})$

$J = 0.35(-21-4) = -0.35 * 25$

$J = -8.75\ kg \cdot m/s$

in the out going direction

7.9 $m = 0.047\ kg$



$\theta = 30°$

only the momentum in the y direction changes

$J_y = P_{yf} - P_{y0} = 0$ conservation of momentum

$J_y = mv_{yf} - mv_{y0}$

$v_{y0} = -v_0 \cos\theta = -45 \cos 30° = -38.97\ m/s$

$v_{yf} = +38.97$

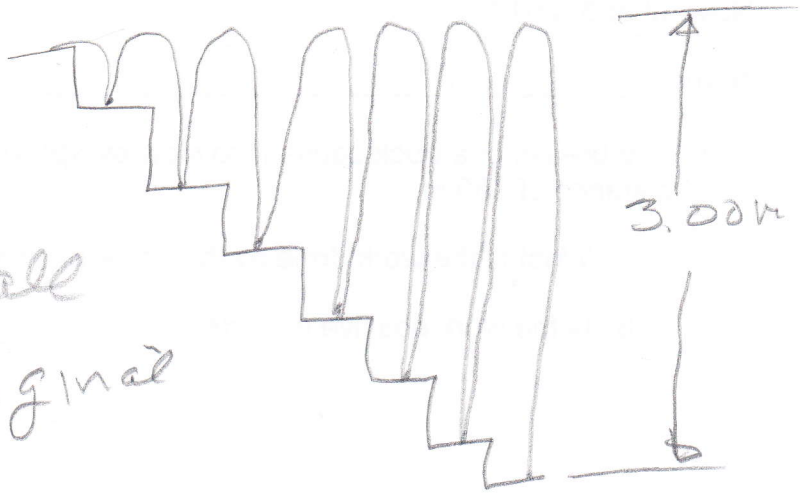
$J = J_y = mv_{yf} - mv_{y0} = m[38.97 - (-38.97)]$

$= .047 * 2 * 38.97 = 3.66$

$J = 3.7\ kg \cdot m/s$

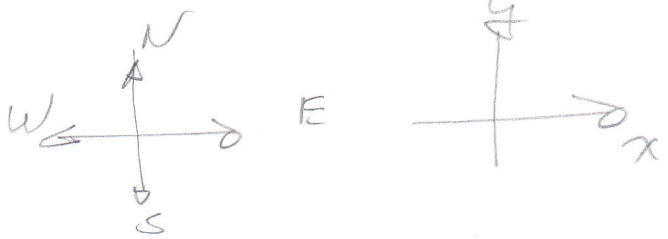
Assignment 9

7.27



Since energy is conserved, the ball returns to the original height.

7.35



$\vec{v}_{1_0} = 3\hat{x}$

$v_{2_0} = -7\hat{y}$

$m_1 = 50.0\ kg$

$m_2 = 70.0\ kg$

$\vec{P}_0 = m_1\vec{v}_{1_0} + m_2\vec{v}_{2_0}$

$\vec{P}_0 = 50*3\hat{x} - 70*7\hat{y} = 150\hat{x} - 490\hat{y}$

$\vec{P}_f = (m_1 + m_2)\vec{v}_f = 120\vec{v}_f$

$\vec{P}_f = \vec{P}_0$

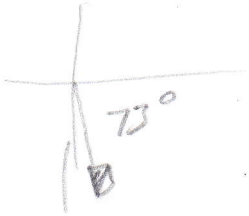
$120\vec{v}_f = 150\hat{x} - 490\hat{y}$

$\vec{v}_f = \frac{150}{120}\hat{x} - \frac{490}{120}\hat{y} = 1.25\hat{x} - 4.08\hat{y}$

$v_f = 4.27\angle -73.0$

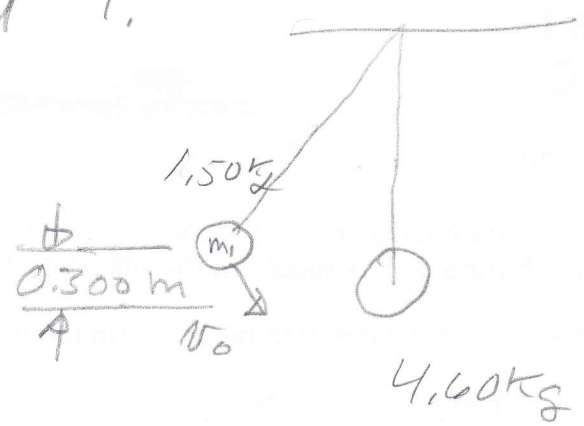
a) $\theta = \tan^{-1}\left(\frac{-4.08}{1.25}\right) = -73.0°$

b) $v = \sqrt{(1.25)^2 + (4.08)^2} = 4.27\ m/s$



Assignment 9.

7.39



$KE_0 + PE_0 = KE_f$

$\frac{1}{2}mv_0^2 + mgh = \frac{1}{2}mv^2$

$v_0 = 5.00 m/s$

$v^2 = v_0^2 + 2gh$

a) $v = \sqrt{v_0^2 + 2gh} = \sqrt{5^2 + 2 \times 9.8 \times 0.3} = \underline{5.56 m/s}$

b) Use the formulas given in the Text

$$v_{f_1} = \frac{m_1 - m_2}{m_1 + m_2} v_{0_1} \quad (7.8a)$$

$$v_{f_2} = \frac{2m_1}{m_1 + m_2} v_{0_1} \quad (7.8b)$$

$v_{0_1} = 5.56 m/s \quad m_1 = 1.50 kg \quad m_2 = 4.60 kg$

$$v_{f_1} = \frac{(1.5 - 4.6)}{1.5 + 4.6} \times 5.56 = -2.83 m/s$$

$$v_{f_2} = \frac{2 \times 1.5}{1.5 + 4.6} \times 5.56 = 2.73 m/s$$

$KE = PE$

$\frac{1}{2}mv^2 = mgh$

$h = \frac{v^2}{2g}$

$$h_1 = \frac{(2.83)^2}{2 \times 9.8} = 0.409 m$$

$$h_2 = \frac{(2.73)^2}{2 \times 9.8} = 0.380 m$$