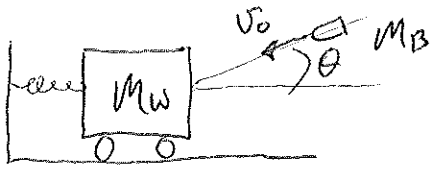
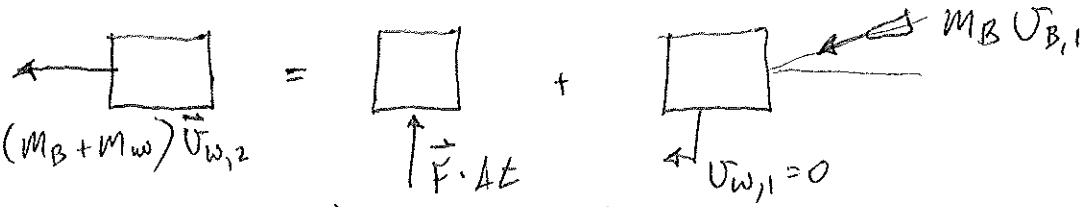
PROB. 13-152



FIND COMPONENTS OF IMPULSE OF THE FORCE EXERTED BY THE BLOCK ON THE BULLET.

$$\vec{v}_{B,1} = v_0\left[(-\cos\theta)\,\hat{i} + (-\sin\theta)\,\hat{j}\right], \quad \vec{v}_{w,1} = 0$$



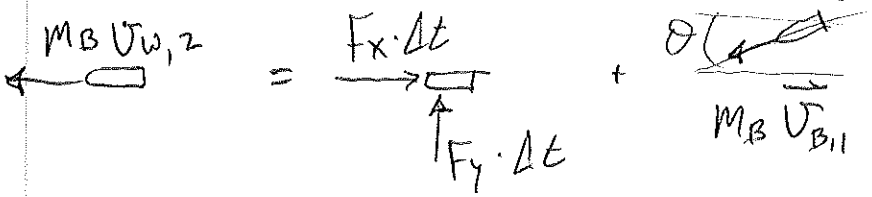
$$\sum M\vec{v}_1 + \sum \int \vec{P}_{1-2} = \sum m\vec{v}_2$$

X-DIRECTION: $-m_B v_0 \cos\theta + 0 + 0 = -(m_B + m_w)\,v_{w,2}$

Y-DIRECTION: $-m_B v_0 \sin\theta + 0 + F_{y,w}\cdot\Delta t = 0$

$$v_{w,2} = \left(\frac{m_B}{m_B + m_w}\right) v_0 \cos\theta$$

BULLET: $m_B\vec{v}_1 + \sum \int \vec{P}_{1-2} = m_B\vec{v}_2$



X-DIRECTION: $-m_B v_0 \cos\theta + F_x\cdot\Delta t = -m_B v_{w,2}$

$$F_x\cdot\Delta t = m_B(v_0\cos\theta - v_{w,2})$$

$$F_x\cdot\Delta t = m_B\left[v_0\cos\theta - \left(\frac{m_B}{m_B + m_w}\right)\cdot v_0\cos\theta\right]$$

$$= m_B v_0\cos\theta\left[1 - \left(\frac{m_B}{m_B + m_w}\right)\right]$$

$$= m_B v_0\cos\theta\left[\frac{m_B + m_w - m_B}{m_B + m_w}\right]$$

$$\boxed{F_x\cdot\Delta t = \frac{m_B m_w v_0\cos\theta}{(m_B + m_w)}}$$

PROB. 13-152 CONT.

Y-DIRECTION:

$$-m_B v_0 \sin\theta + F_y \cdot \Delta t = 0$$

$$\boxed{F_y \cdot \Delta t = m_B v_0 \sin\theta}$$