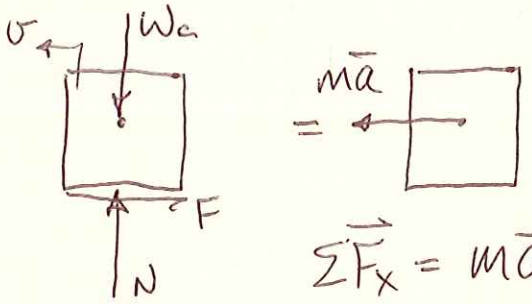
PROB. 16-10

$W_F = 2250^{LB}$, $W_c = 2500^{LB}$, $\vec{v} = (-10)\hat{i}\ \frac{ft}{s}$

$\mu = 0.3$, FIND $x - x_0$ FOR CRATE NOT TO SLIDE AND FORKLIFT NOT TO TIP FORWARD.

CRATE: IMPENDING MOTION



$\Sigma F_y = m\bar{a}_y$: $N - W_c = 0$

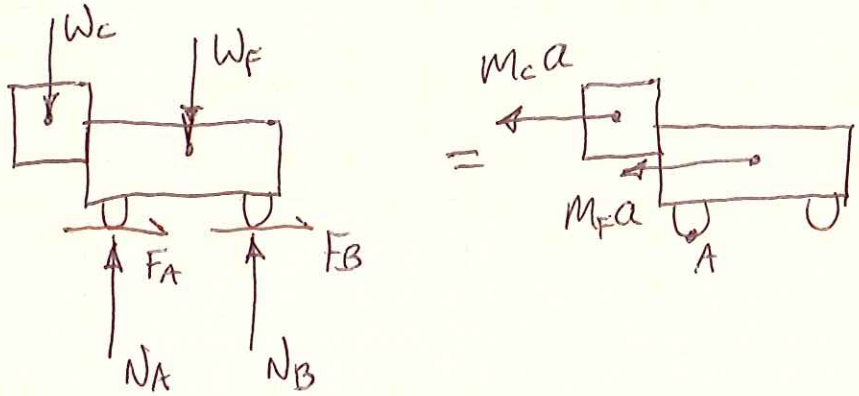
$N = 2500^{LB}$

$\Sigma \vec{F}_x = m\bar{a}_x$: $F = -M_c a$

$\mu N = -\left(\frac{W_c}{g}\right)a$

$$a = -\frac{\mu N g}{W_c} = -\frac{(0.3)(2500^{LB})(32.2\ \frac{ft}{s^2})}{(2500^{LB})} = -9.66\ \frac{ft}{s^2}$$

FORKLIFT TENDS TO TIP CCW $\circlearrowleft$: $N_B = 0$



$\Sigma \vec{M}_A = \Sigma (\vec{M}_A)_{EFF}$ $\circlearrowleft$:

$3W_c - 4W_F = 4M_c a + 3M_F a$

$4\left(\frac{W_c}{g}\right)a + 3\left(\frac{W_F}{g}\right)a = 3W_c - 4W_F$

PROB. 16-10 CONT.

$$\frac{a}{g}(4W_C + 3W_F) = (3W_C - 4W_F)$$

$$a = g\,\frac{(3W_C - 4W_F)}{(4W_C + 3W_F)}$$

$$a = \left(32.2\ \tfrac{ft}{s^2}\right)\left[\frac{3(2500^{LB}) - 4(2250^{LB})}{4(2500) + 3(2250)}\right] = \boxed{a = -2.883\ \tfrac{ft}{s^2}}$$

$a_{TIPPING} < a_{SLIDING}$: FORK LIFT WILL TIP BEFORE CRATE SLIDES

$$v^2 = v_0^2 + 2a(x - x_0)$$

$$(x - x_0) = \frac{1}{2a}(v^2 - v_0^2)$$

$$(x - x_0) = \frac{1}{2(-2.883\ \frac{ft}{s^2})} \cdot \left[0 - (10\ \tfrac{ft}{s})^2\right]$$

$$\boxed{(x - x_0) = 17.34\ ft}$$