Problem 4: Friction II
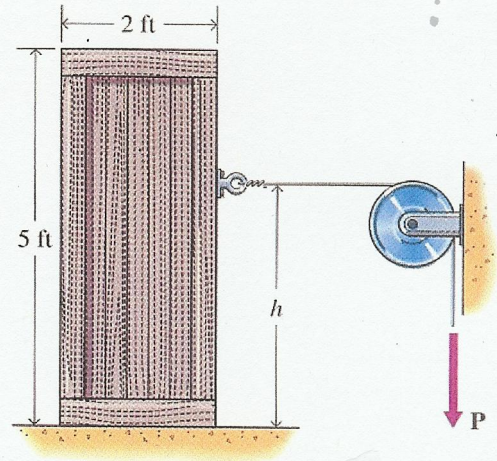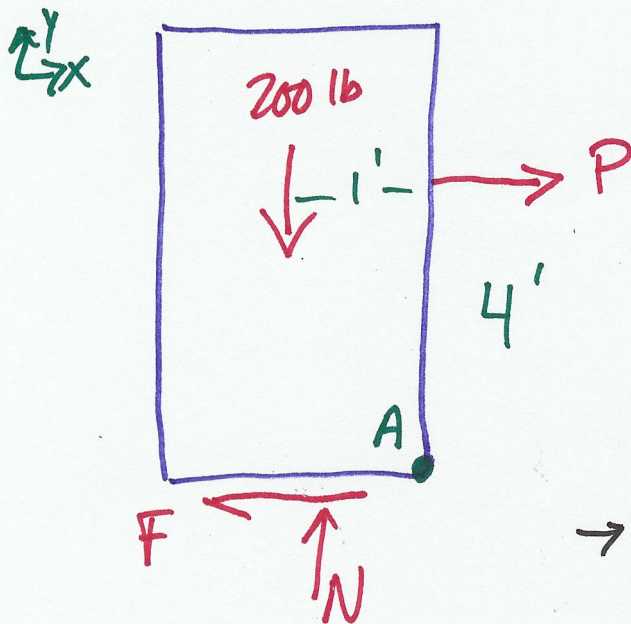The 200-lb crate is being moved by a rope passing over a smooth pulley. The coefficient of static friction between the crate and the floor is $\mu_s = 0.30$.

a. Assume that $h = 4$ ft and determine the force **P** necessary to produce impending motion.

b. Determine the value of h for which impending motion by slipping and tipping would occur simultaneously.

Handwritten solution:

FBD

y
x

200 lb

$\leftarrow 1' \rightarrow$

$\rightarrow$ P

4'

A

F

N

a) Assume Tipping

$\circlearrowleft \Sigma M_A = 0$

$4P - 200(1) = 0$

$P = 50\ lb$

Assume Slipping

$\uparrow \Sigma F_y = 0$ $-200 + N = 0$

$N = 200\ lbs$

$\rightarrow \Sigma F_x = 0$

$-F + P = 0$ $F = \mu_s N$

$-.3(200) + P = 0$ $P = 60\ lbs$

$\therefore$ TIPS @ 50 lbs

b) Simultaneous motion

Slipping @ 50 lb = P

$\circlearrowleft \Sigma M_A = 0$

$h(50) - 200(1) = 0$ $h = 3.33'$