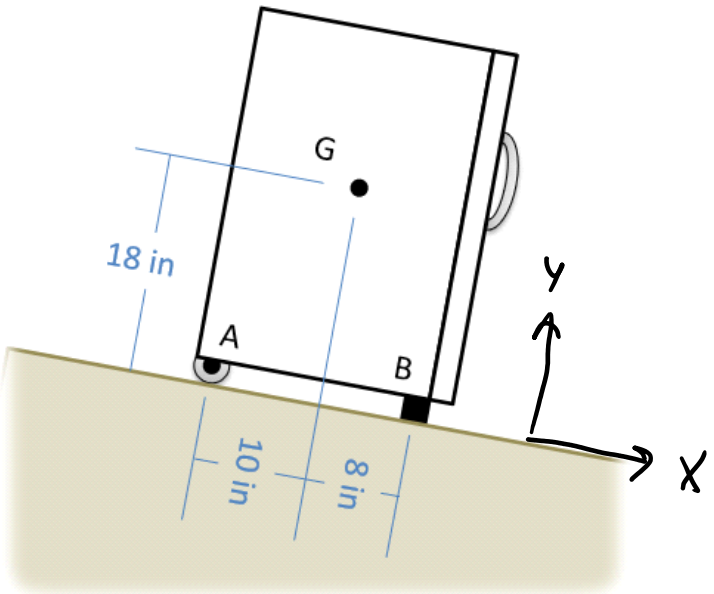
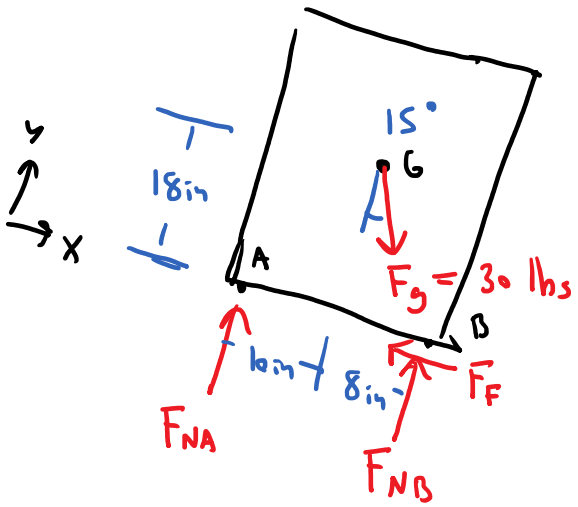
Problem 5

A cabinet with a weight of 30 lbs is sitting on a 15 degree incline as shown below. The cabinet has a pair of rubber feet at the front (A), and a pair of frictionless wheels at the back (B). What is the minimum value for the static coefficient of friction for the rubber feet at the front to ensure the cabinet does not roll down the incline?





$$\Sigma F_x = 30\sin(15) - F_F = 0$$

$$\Sigma F_y = F_{NA} + F_{NB} - 30\cos(15) = 0$$

$$\Sigma M_A = (F_{NB})(18) - [30\cos(15)](10) - (30\sin(15))(18) = 0$$

$$F_{NB} = \frac{30\cos(15)(10) + 30\sin(15)(18)}{18} = \underline{23.86 \text{ lbs}}$$

$$F_F = 30\sin(15) = \underline{7.76 \text{ lbs}}$$

Assume impending motion

$$F_F = \mu_s F_{N_B} \rightarrow \quad \mu_s = \frac{F_F}{F_{N_B}} = \frac{7.76}{23.86}$$

$$\boxed{\mu_s = .325}$$

minimum value