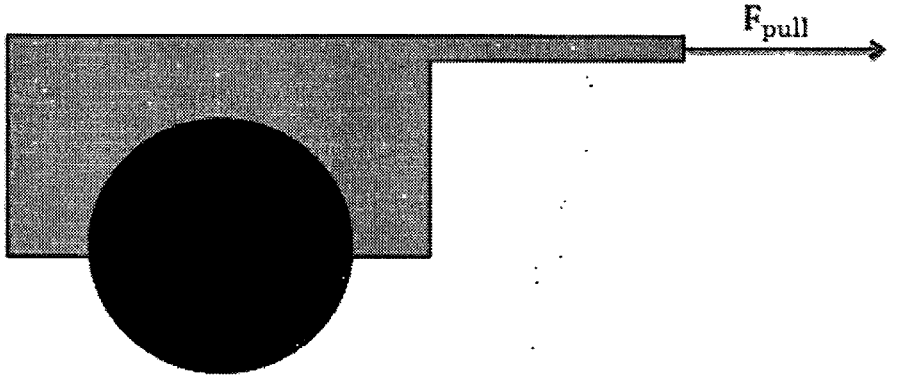
A cart and it's load weigh a total of 200 lbs. There are two wheels on the cart each with a diameter of 2 feet and each supporting half of the 200 pound load. The bearing attaching each wheel to the cart is a lubricated steel on steel (kinetic coefficient of friction = .05) journal bearing with a shaft one inch in diameter. What is the moment due to friction from each bearing? Assuming there are no other sources of friction, what magnitude must the pulling force have in order to keep the cart moving at a constant speed?

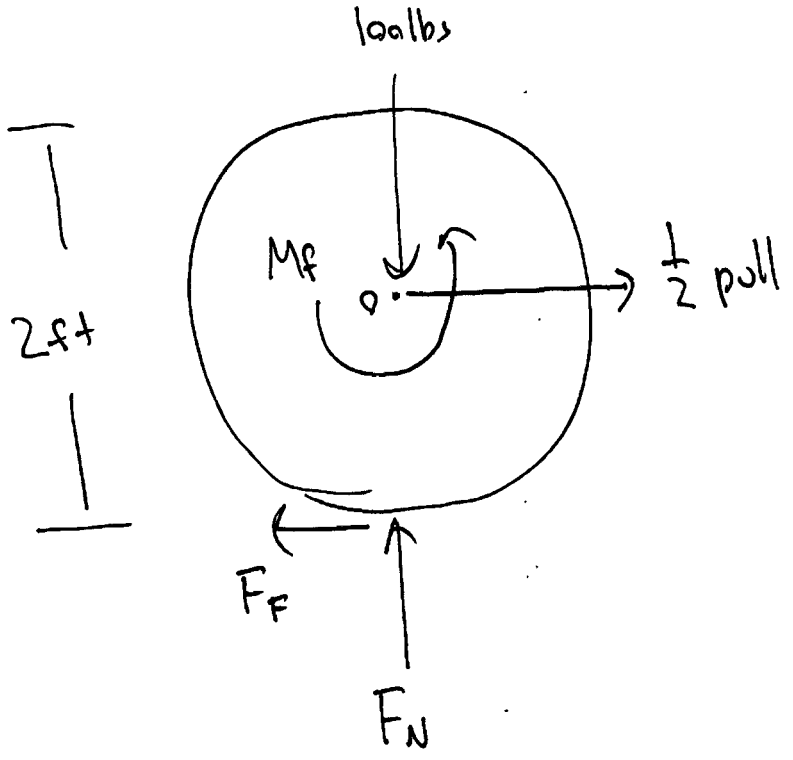


$$M_f = (r_{shaft})(\mu_k)(F_N)$$

$$M_f = (.5\text{ in})(.05)(100\text{ lbs})$$

$$M_f = 2.5\text{ in lbs}$$

for each wheel



$$\sum M_o = (2.5 \text{ in lbs}) - (F_F)(12 \text{ in}) = 0$$

$$F_F = .208 \text{ lbs}$$

$$\sum F_x = \frac{1}{2} F_{pull} - F_F = 0$$

$$F_{pull} = .416 \text{ lbs}$$