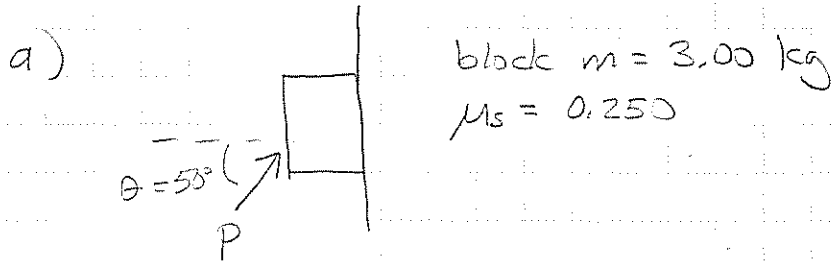
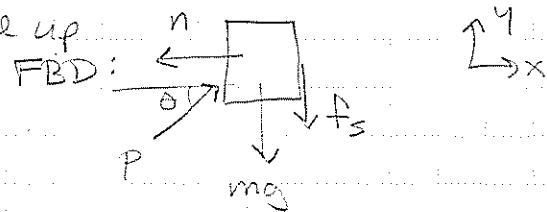


Physics 200B assignment 6

1. $\Sigma \rightarrow$ Ch 5 problem 44



if P is too large, block will slide up just before this happens,



so

$$\Sigma F_x = \text{max}$$

$$P \cos \theta - n = 0 \rightarrow n = P \cos \theta$$

$$\Sigma F_y = \text{max}$$

$$P \sin \theta - f_s - mg = 0 \quad \text{and just before slipping } f_s = f_{s, \text{max}} = \mu_s n$$

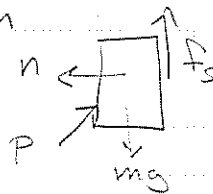
so $P \sin \theta = \mu_s n + mg = \mu_s P \cos \theta + mg$

solve for P : $P (\sin \theta - \mu_s \cos \theta) = mg$

$$P = \frac{mg}{\sin \theta - \mu_s \cos \theta} = \frac{(3 \text{ kg})(9.8 \text{ m/s}^2)}{\sin 50 - 0.25 \cos 50}$$

$$= 48.6 \text{ N} = P_{\text{max}}$$

if P is too small, block will slide down just before this happens,



so $\Sigma F_x = \text{max}$

$$P \cos \theta - n = 0 \rightarrow n = P \cos \theta$$

$$\Sigma F_y = \text{max}$$

$$P \sin \theta + f_s - mg = 0 \quad \text{again, just before slipping, } f_s = f_{s, \text{max}} = \mu_s n$$

$$\rightarrow P \sin \theta = mg - \mu_s n = mg - \mu_s P \cos \theta$$

solve for P :

$$P (\sin \theta + \mu_s \cos \theta) = mg$$

$$P = \frac{mg}{(\sin \theta + \mu_s \cos \theta)} = 31.7 \text{ N}$$

block remains stationary for $31.7 \text{ N} \leq P \leq 48.6 \text{ N}$

b) if $P < 31.7 \text{ N}$, block slides down
 if $P > 48.6 \text{ N}$, block slides up