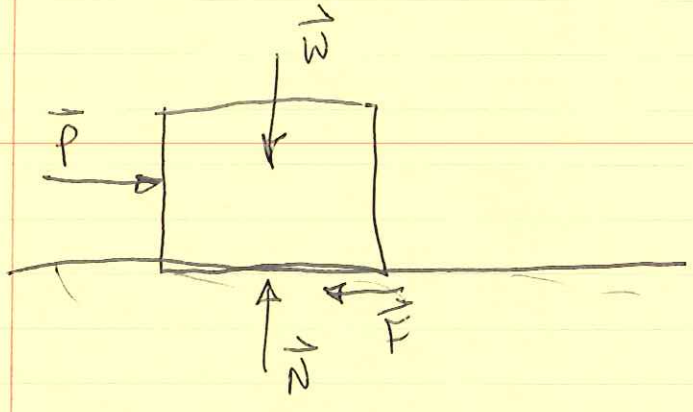
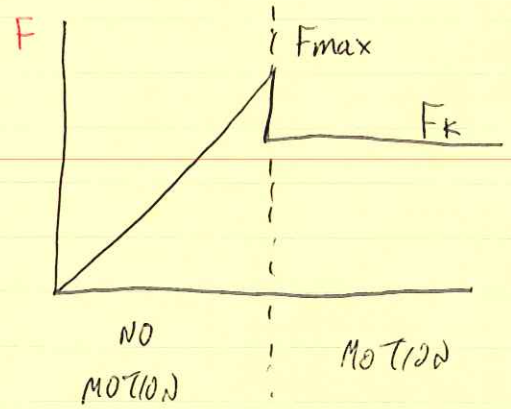
FRICTION

FRICTION FORCES OPPOSE MOTION.





$F_{max} = \mu_s N$ COEFFICIENT OF STATIC FRICTION

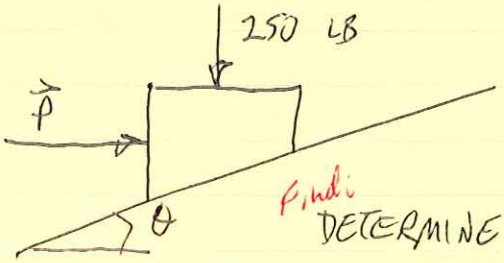
$F_K = \mu_K N$ COEFFICIENT OF KINETIC FRICTION

NO MOTION WILL OCCUR IF $\vec{F} < \vec{F}_{max} = \mu_s N$

MOTION WILL OCCUR IF $\vec{F} > \vec{F}_{max}$. AT THIS POINT, $\vec{F} = \mu_K N$

IF MOTION IS IMPENDING, $\vec{F} = \vec{F}_{max} = \mu_s N$

EXAMPLE PROB. 8.1



Given: Schematic

$\mu_s = 0.3$, $\mu_K = 0.2$

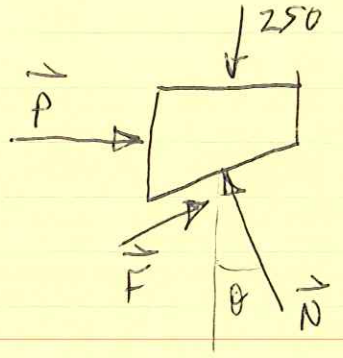
$\theta = 30°$, $P = 50$ LB

Find:

DETERMINE IF BLOCK IS IN EQUILIBRIUM, MAGNITUDE & DIRECTION OF FRICTION FORCE.

PROB. 8.1 CONT.

FBD



ASSUME BLOCK IS IN EQUILIBRIUM.

$\vec{F} = (F\cos 30^\circ)\,\hat{i} + (F\sin 30^\circ)\,\hat{j}$ LB

$\vec{N} = (-N\sin 30^\circ)\,\hat{i} + (N\cos 30^\circ)\,\hat{j}$ LB

$\Sigma F_x = 0: \quad P + F\cos 30 - N\sin 30 = 0$

$0.866F - 0.5N = -50$

$\Sigma F_y = 0: \quad -250 + F\sin 30 + N\cos 30 = 0$

$0.5F + 0.866N = 250$

$N = 241.5$ LB, $\quad F = 81.7$ LB

MAXIMUM FRICTION FORCE:

$F_{max} = \mu_s N = (0.3)(241.5\ \text{LB}) = 72.4$ LB

SINCE $F > F_{max}$, BLOCK WILL SLIDE DOWN

FRICTION FORCE:

$F = \mu_K N = (0.2)(241.5\ \text{LB}) = 48.3$ LB

FRICTION FORCE IS DIRECTED UP THE PLANE BECAUSE IT OPPOSES MOTION