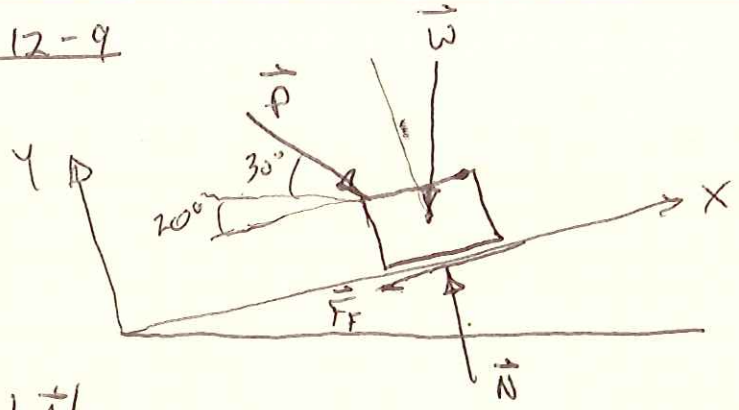
PROB. 12-9



$m = 20^{kg}$

$t = 10^{s}$

$x - x_0 = 5^{m}$

$\mu_s = \mu_k = 0.3$

FIND $|\vec{P}|$

$$x = x_0 + v_0 t + \frac{1}{2} a t^2$$

$$a_x = \frac{2}{t^2}\left[(x - x_0) - v_0 t\right] = \frac{2(5^m)}{(10^5)^2} = 0.1 \ \frac{m}{s^2}$$

$$\vec{W} = (-mg \cdot \sin 20^\circ)\hat{i} + (-mg \cdot \cos 20^\circ)\hat{j} \ N$$

$$\vec{P} = (P \cdot \cos 50^\circ)\hat{i} + (-P \cdot \sin 50^\circ)\hat{j} \ N$$

$$\vec{F_F} = (-\mu N)\hat{i}$$

$$\vec{N} = (N)\hat{j}$$

$$\Sigma F_y = m a_y$$

$$-mg \cdot \cos 20^\circ - P \cdot \sin 50^\circ + N = 0$$

$$N = mg \cdot \cos 20^\circ + P \cdot \sin 50^\circ$$

$$\Sigma F_x = m a_x$$

$$-mg \cdot \sin 20^\circ + P \cdot \cos 50^\circ - \mu N = m a_x$$

$$-mg \cdot \sin 20^\circ + P \cdot \cos 50^\circ - \mu\left(mg \cdot \cos 20^\circ + P \cdot \sin 50^\circ\right) = m a_x$$

PROB. 12-9 CONT

$$P(\cos 50^\circ - \mu \cdot \sin 50^\circ) = Ma_x + Mg \cdot \sin 20^\circ + \mu Mg \cdot \cos 20^\circ$$

$$P = \frac{m[a_x + g(\sin 20^\circ + \mu \cdot \cos 20^\circ)]}{(\cos 50^\circ - \mu \cdot \sin 50^\circ)}$$

$$P = \frac{(20\,kg)\{(0.1\,\frac{m}{s^2}) + (9.81\,\frac{m}{s^2})[\sin 20^\circ + (0.3) \cdot \cos 20^\circ]\}}{[\cos 50^\circ - (0.3) \cdot \sin 50^\circ]}$$

$$\boxed{P = 301.2\,N}$$