

PROB, 12-8

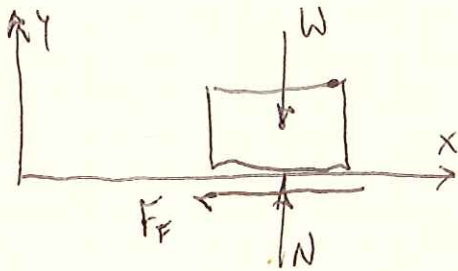
$$v_0 = 60 \frac{\text{mi}}{\text{h}} = 88 \frac{\text{ft}}{\text{s}}, v = 0, (x - x_0) = 150 \text{ ft}$$

$$v^2 = v_0^2 + 2a(x - x_0)$$

$$a_{\text{LEVEL}} = \frac{v^2 - v_0^2}{2(x - x_0)} = \frac{(0) - (88 \frac{\text{ft}}{\text{s}})^2}{2(150 \text{ ft})} = -25.81 \frac{\text{ft}}{\text{s}^2}$$

a) FIND $(x - x_0)$ GOING UP 5° INCLINE

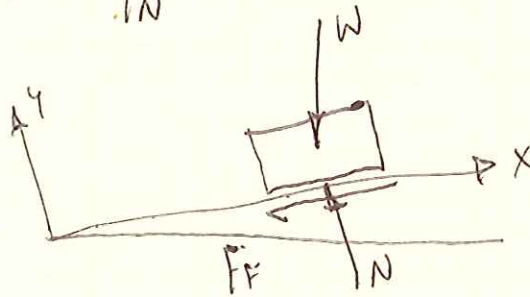
b) FIND $(x - x_0)$ GOING DOWN 3% GRADE



$$\Sigma F_x = m a_x$$

$$-F_f = \frac{W}{g} \cdot a_{x, \text{LEVEL}}$$

PART a):



$$\Sigma F_x = m a_{x, \text{INCLINE}}$$

$$-F_f - W \sin 5^\circ = m a_{x, \text{in}}$$

$$\left(\frac{W}{g} \cdot a_{x, \text{h}}\right) - W \sin 5^\circ = \frac{W}{g} \cdot a_{x, \text{in}}$$

$$a_{x, \text{in}} = a_{x, \text{h}} - g \cdot \sin 5^\circ = \left(-25.81 \frac{\text{ft}}{\text{s}^2}\right) - \left(32.2 \frac{\text{ft}}{\text{s}^2}\right) \sin 5^\circ$$

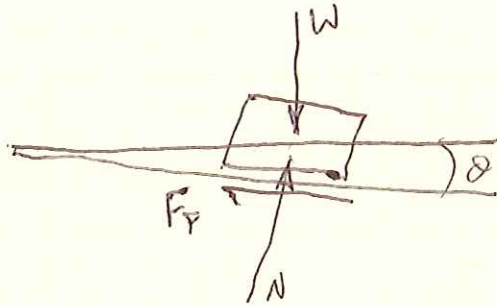
$$a_{x, \text{in}} = -28.62 \frac{\text{ft}}{\text{s}^2}$$

$$(x - x_0) = \frac{v^2 - v_0^2}{2 a_{\text{in}}} = \frac{(0) - (88 \frac{\text{ft}}{\text{s}})^2}{2(-28.62 \frac{\text{ft}}{\text{s}^2})} = \boxed{135.3 \text{ ft}}$$

PART b): 3% GRADE

$$\theta = \text{TAN}^{-1}\left(\frac{3}{100}\right) = 1.72^\circ$$

PROB. 12-8 CONT.



$$\Sigma F_x = m a_{x, \text{DECLINE}}$$

$$-F_f + W \sin 1.72^\circ = m a_{x, D}$$

$$\left(\frac{W}{g} \cdot a_{x, U}\right) + W \sin 1.72^\circ = \frac{W}{g} \cdot a_{x, D}$$

$$a_{x, D} = a_{x, U} + g \sin 1.72^\circ$$

$$a_{x, D} = \left(-25.81 \frac{\text{ft}}{\text{s}^2}\right) + \left(32.2 \frac{\text{ft}}{\text{s}^2}\right) \sin 1.72^\circ = -24.84 \frac{\text{ft}}{\text{s}^2}$$

$$(x - x_0) = \frac{v^2 - v_0^2}{2a_D} = \frac{(0) - \left(88 \frac{\text{ft}}{\text{s}}\right)^2}{2(-24.84 \frac{\text{ft}}{\text{s}^2})} = \boxed{155.8 \text{ ft}}$$