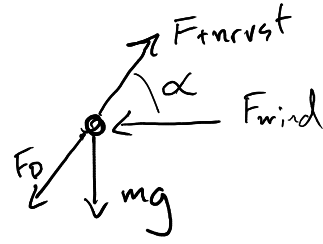
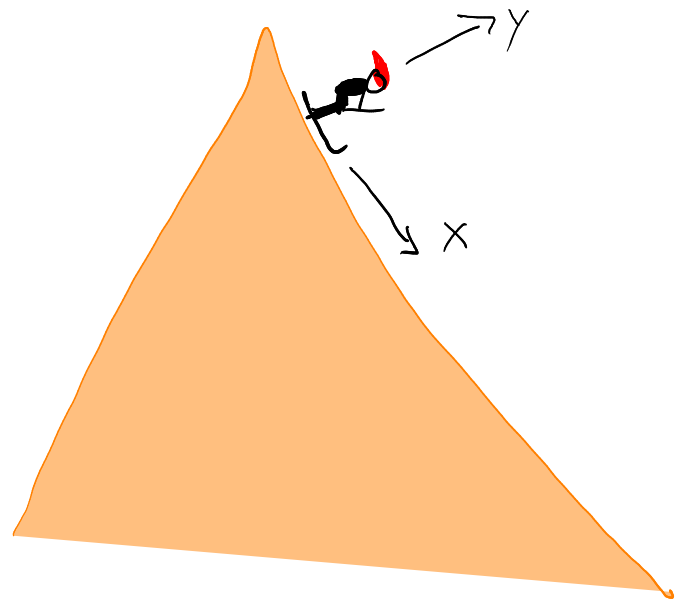
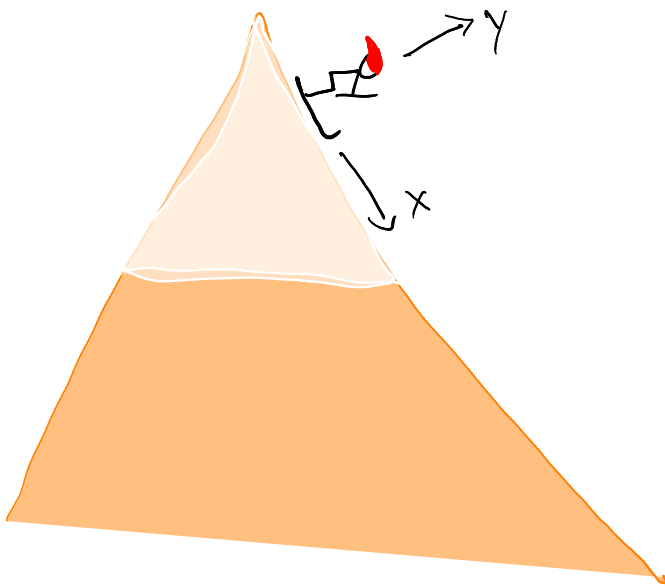
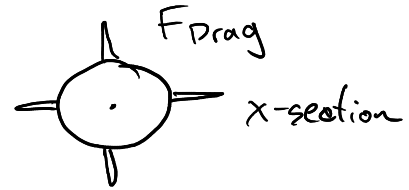


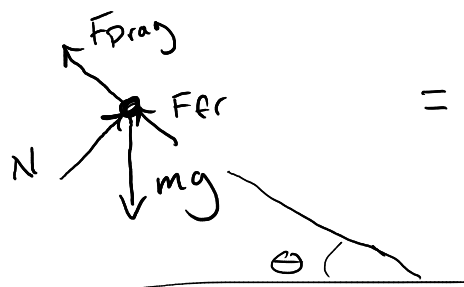
FBD



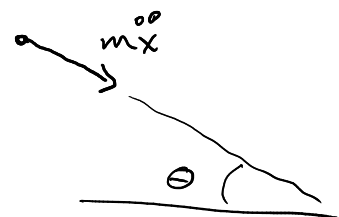
$F_{wind}$  x-section



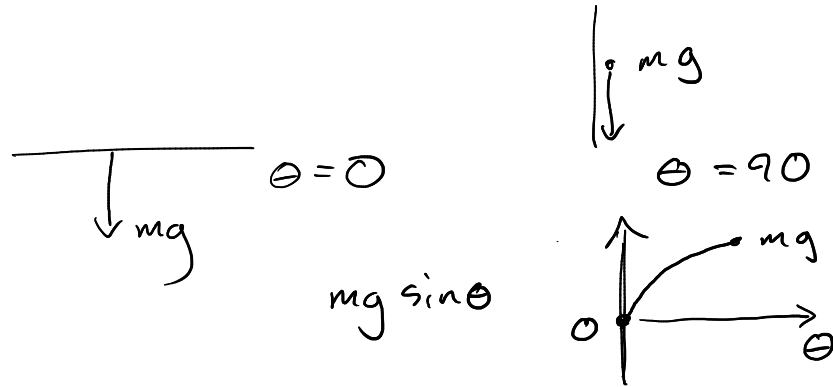
FBD



RD



Find x-axis forces  $\left[ \begin{array}{c} -F_{\text{drag}} - F_{\text{fr}} \\ +mg \sin \theta \end{array} \right] = m \frac{d^2 x}{dt^2} = m \ddot{x}$



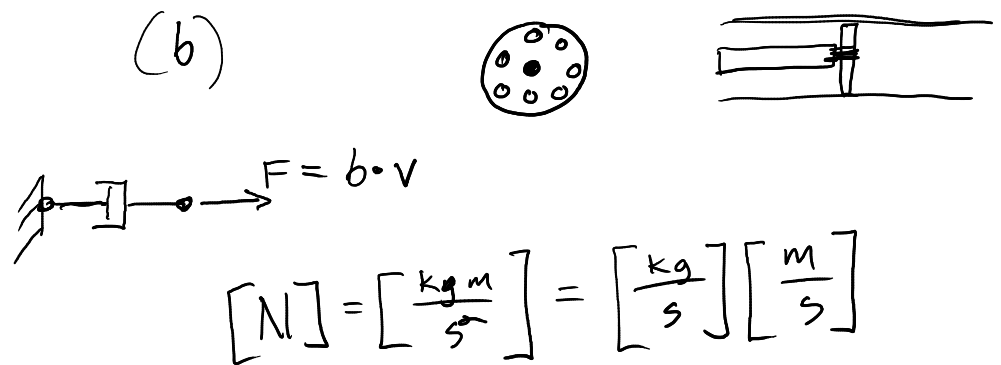
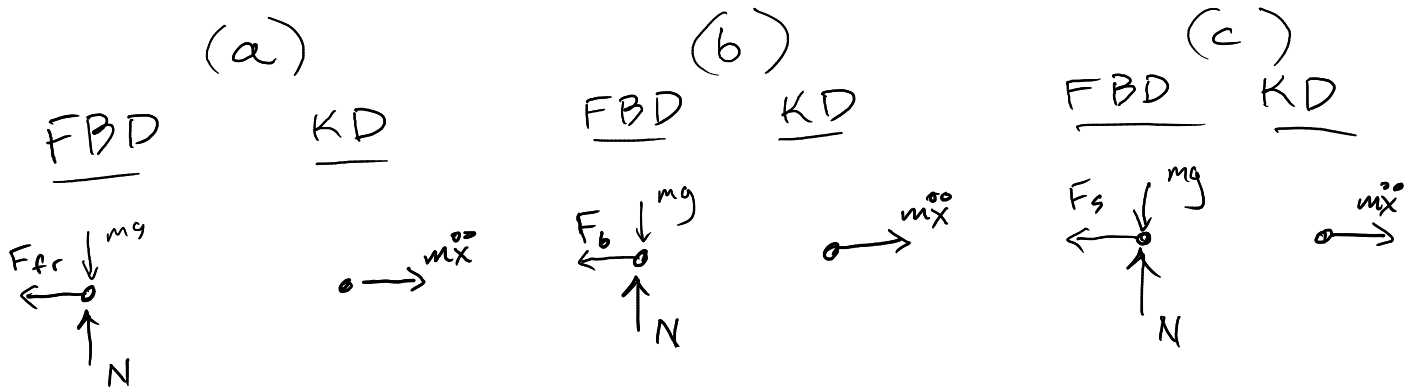
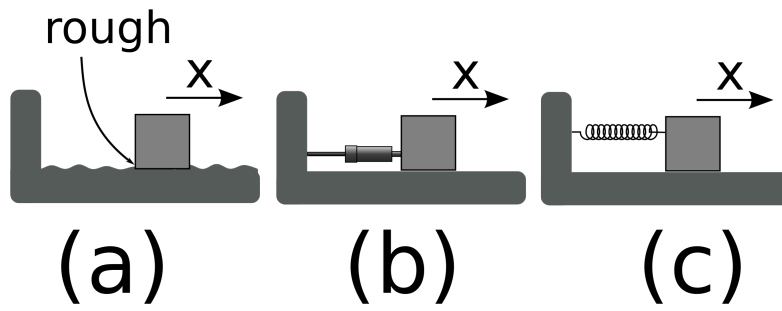
$$mg \sin \theta - \frac{1}{2} C_D A \rho \dot{x}^2 - \mu mg \cos \theta = m \ddot{x}$$

case 1  
 $m = 50 \text{ kg}$

case 2  
 $m = 100 \text{ kg}$

$$\begin{array}{lcl} \ddot{x}_1 & = & \ddot{x}_2 \quad \text{if } C_D = 0 \\ \ddot{x}_1 & = & \ddot{x}_2 \quad \text{if } v = 0 \\ \ddot{x}_1 & < & \ddot{x}_2 \quad \text{if } C_D > 0 \end{array}$$

$$g \sin \theta - \frac{\frac{1}{2} C_D \rho A \dot{x}^2}{m} - \mu g \cos \theta = \ddot{x}$$



(c)

$$\overset{kx}{\leftarrow} = \overset{m\ddot{x}}{\rightarrow} \implies -kx = m\ddot{x}$$

$$\ddot{x} = -\frac{k}{m} x$$



$$a = -\frac{k}{m}x$$

$a \neq \text{cst}$

~~$$x = x_0 + \dot{x}_0 t - \frac{k}{m} \frac{t^2}{2}$$~~

$$\ddot{x} = -\frac{k}{m}x$$

$$x(t) = A \cos \omega t + B \sin \omega t$$

$$\ddot{x}(t) = -\omega^2 (A \cos \omega t + B \sin \omega t)$$

~~$$-\omega^2 (A \cos \omega t + B \sin \omega t) = -\frac{k}{m} (A \cos \omega t + B \sin \omega t)$$~~

$$\omega^2 = \frac{k}{m} \quad \omega = \sqrt{\frac{k}{m}} \equiv \text{natural frequency}$$

$$x(0) = 0 = A$$

$$\dot{x}(0) = 10 = B \sqrt{\frac{k}{m}}$$

$$x(t) = \sqrt{\frac{m}{k}} \cdot 10 \sin \sqrt{\frac{k}{m}} t$$