

# Chapter 6: Force and Motion — 2

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December 11, 2020

## General

### Quantities

$F$  = force  
 $m$  = mass  
 $v$  = velocity  
 $a$  = acceleration  
 $g$  = magnitude of free-fall acceleration  
 $f$  = friction force  
 $W$  = weight  
 $N$  = normal force  
 $D$  = drag force  
 $R$  = radius  
 $\mu_s$  = coefficient of static friction  
 $\mu_k$  = coefficient of kinetic friction  
 $C$  = drag coefficient  
 $\rho$  = air density  
 $A$  = cross-sectional area  
 $v_t$  = terminal speed

### Constants

$$g = 9.8 \text{ m/s}^2$$

## 1 Friction

### Static Friction

$$f_{s,\max} = \mu_s N \tag{1}$$

### Kinetic Friction

$$f_k = \mu_k N \tag{2}$$

## 2 The Drag Force and Terminal Speed

### Drag

$$D = \frac{1}{2} C \rho A v^2 \tag{3}$$

**Terminal Speed**

$$v_t = \sqrt{\frac{2W}{C\rho A}} \quad (4)$$

### 3 Uniform Circular Motion

**Centripetal Acceleration**

$$a = \frac{v^2}{R} \quad (5)$$

**Centripetal Force** A centripetal force accelerates a body by changing the direction of the body's velocity without changing the body's speed.

$$F = m\frac{v^2}{R} \quad (6)$$