

Phys171 - Thu 2/6

Continue Chapter 4

Fri: start Chapter 5

NOTE: Several HW due this Fri

Forces

Frictional forces:

Static

$$f_s \leq \mu_s n$$

Dynamic (moving on surface)

$$f_k = \mu_k n$$

Gravitational force

$$\vec{F}_g = m\vec{g}$$

Weight is magnitude of F_g

NOTE: Mass and weight are two different quantities

Mass determines inertia and gravitational force

->depends on Mass of other object which exerts a gravitational force, and distance from center of that other object

$$f_s \leq \mu_s n$$

$$f_k = \mu_k n$$

$$F_g = mg$$

Direction of forces

Should we put vectors on the friction and normal force in the friction force equation?

Forces accelerate: Newton's second Law

$$\vec{F} = m\vec{a}$$

Need force to accelerate

Law applies to forces exerted **ON** individual object

Larger Mass, less acceleration for same force

More than one force can be applied to one object: vector sum of all forces yields net force on object!

$$\sum \vec{F} = m\vec{a}$$

Units of Force? $kg \frac{m}{s^2}$

Derived units: Newton (N)

Newton's first law: *law of inertia*

An object will resist attempts to change its velocity (objects have *inertia*)

If an object does not interact with other objects (i.e. experiences no force), it has zero acceleration.

Note: To apply this law, need to use a frame of reference that does not accelerate (*inertial reference frame*)

More About Newton's Second Law

$$\sum \vec{F} = m\vec{a}$$

Like any vector equation Newton's Second Law can also be expressed in terms of components:

$$\Sigma F_x = m a_x$$

$$\Sigma F_y = m a_y$$

$$\Sigma F_z = m a_z$$

Application of Newton's law to equilibrium

Equilibrium: Zero Net Force

-> The acceleration is equal to zero

-> The velocity does not change

The object, if at rest, will remain at rest

If the object is moving, it will continue to move in same direction at same speed

$$\sum \vec{F} = 0$$

$$\sum F_x = 0 \text{ and } \sum F_y = 0$$

