

Forces: Chapter 4 and 5

Definition of Dynamics

Dynamics is the study of why an object moves.

In order to understand why objects move, we must first study forces.

Forces

A *force* is defined as a push or a pull.

Forces are vector quantities - they have magnitude and direction.

In the last unit, the sum of all the forces acting on an object was referred to as the resultant force. *Net force*, \vec{F}_{net} , is another term used for the vector sum of forces.

Types of Forces

An object can experience many different forces simultaneously. Some of the more common forces are listed below.

\vec{F}_g : gravitational force (force of *gravity*)
- this is an attractive force that acts over a distance between masses

NOTE: Weight is the force of gravity acting on an object.

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

F_g -> Force of gravity or weight (N)

m -> mass (kg)

g -> acceleration due to gravity (m/s^2)

PRACTICE PROBLEMS

1. Find the weight of a 2.3 kg bowling ball on Earth.
2. You have a weight of 652.58 N[down] while standing on a spring scale on Earth near the equator.
 - (a) Calculate your mass.
 - (b) Determine your weight on Earth near the North Pole.
 - (c) Determine your weight on the International Space Station. Why would this value be impossible to verify experimentally?
3. The lunar roving vehicle (LRV) pictured here has a mass of 209 kg regardless of where it is, but its weight is much less on the surface of the Moon than on Earth. Calculate the LRV's weight on Earth and on the Moon.
4. A 1.00 kg mass is used to determine the acceleration due to gravity of a distant, city-sized asteroid. Calculate the acceleration due to gravity if the mass has a weight of 3.25×10^{-2} N[down] on the surface of the asteroid.

