

Newton's Laws

Newton's Laws are the laws which describe acceleration of objects based on the forces acting on them. They are still used and accurate for human sizes and speeds.

In general we want to set up a Free Body Diagram showing all the forces acting on an object.

Eg: A 10kg zombie head is being pulled along the ground with 30 N of force. The coefficient of friction on the ground is .20.

A 200kg skier is on a 30° slope with a $\mu = .40$.

Newton's First Law:

"The Law of Inertia" If an object experiences no net force then then it will remain at a constant velocity. ie: If you don't do something to it -- it will keep doing what it was doing.

*People used to think that an object's velocity tended to zero as that is what every object they ever saw did.

Newton's Second Law:

$$F_{net} = ma$$

Find the acceleration of the zombie head and the skier from the above examples...

Newton's Third Law:

If any object, A, exerts a force on another object, B, then B must exert an equal but opposite force on A.

Acceleration in multibody systems:

- 1) Label all forces acting on every body in the system
- 2) Find the total force (F_{net}) by thinking which forces work together or against each other.
- 3) Use Newton's 2nd law to find acceleration.

Pulley Example:

A rock of mass 2.0 kg is thrown upward with a force of 36N, what is the a_0 ?

A rocket accelerates upward at 3.0m/s^2 . If it had a mass of 1000kg what force of thrust must the engines be applying?