Newton's Laws

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Oct 28, 2024

Newton's First Law

In an inertial reference frame, any isolated object that is at rest remains at rest, and any isolated object that is in motion remains in motion

Newton's Second Law

The net force is equal to the mass times the acceleration.

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

This equation is only valid for systems where the mass is constant. For non-constant masses, the net force is the time derivative of momentum.

$$\sum \vec{F} = \frac{d\vec{p}}{dt}$$

Newton's Third Law

Whenever two objects interact, they exert on each other forces that are equal in magnitude but opposite in direction.

$$F_{\text{A on B}} = -F_{\text{B on A}}$$