

Forces & Motion

Newton's First Law of Motion

• If no force acts on a body, the body's velocity cannot change; i.e: body can not accelerate.

$$\cdot \Sigma F_{\text{net}} = 0$$

• Note: If the question says the body moves with constant speed then use $\Sigma F_{\text{net}} = 0$.

Inertial Reference Frame: A frame of reference in which newton's laws hold

Newton's Second Law of Motion

$$\cdot \Sigma F_{\text{net}} = ma$$

$$\rightarrow \text{If net force is constant, } a \propto \frac{1}{m} \quad / \quad m \propto \frac{1}{a}$$

$$\rightarrow \Sigma \vec{F}_x = m \vec{a}_x$$

$$\rightarrow \Sigma \vec{F}_y = m \vec{a}_y$$

$$\rightarrow \Sigma \vec{F}_z = m \vec{a}_z$$

Note: Net force and acceleration on an axis are always in the same direction.

Newton's Third Law of Motion

$$\cdot \vec{F}_{\text{action}} = -\vec{F}_{\text{reaction}}$$

Forces to see when solving problems

- Gravitational Force

Note: See M1 notes for pulley +

- Weight

inclined planes questions

- Normal Force

- Friction

- Tension (always acts away from the object at which forces are resolved.)

Principle of Superposition: $F_1 + F_2 + F_3$

Sample Problems: 5.01, 5.02, 5.03, 5.04, 5.06

Exercise Problems: 2, 3, 4, 5, 6, 7, 8, 9, 10, 17, 19, 23