

Chapter 3: Forces and Newton's Laws

Section 2: Newton's Laws of Motion

Force: a push or a pull on an object

Newton's first law of motion: states that an object moves at a constant velocity unless an unbalanced force acts on it

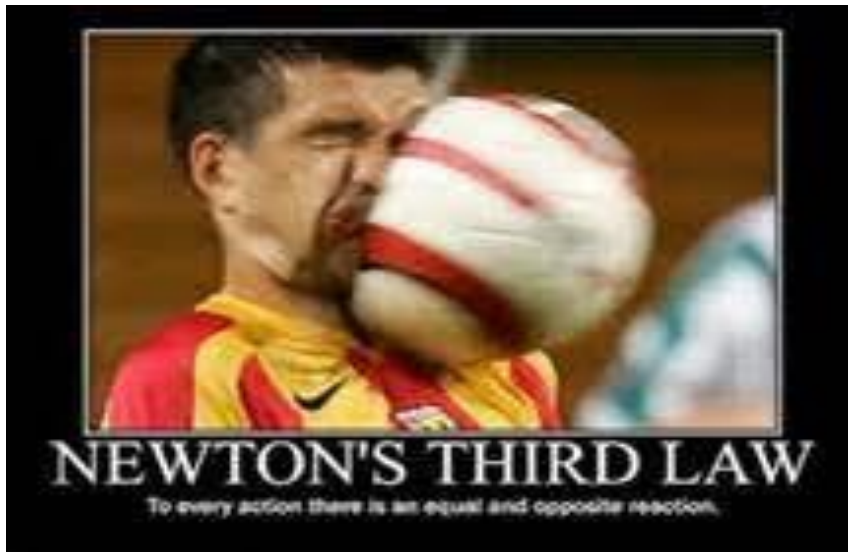
- The motion of an object changes only if an unbalanced force acts on the object
- An object in motion will stay in motion unless acted upon
- An object at rest will stay at rest unless acted upon
- Sometimes Newton's 1st law is called the law of inertia
- The greater the mass, the greater the inertia
 - Compare a bowling ball to a tennis ball

Newton's second law of motion: describes how the forces exerted on an object, its mass, and its acceleration are related

- Think about throwing a ball
 - How does it change if you throw it really hard or tossing it gently?
- Think about throwing a baseball vs. a softball
 - If you throw at the same force, will they have the same speed?
- $\text{Force}_{\text{net}} = m \times a = \text{mass (in kg)} \times \text{acceleration (in m/s}^2\text{)}$
 - $1 \text{ N} = 1 \text{ kg} \cdot \text{m/s}^2$
- It can be rearranged to this equation
 - $\text{acceleration} = \text{Force/mass}$

Newton's third law of motion: states that when one object exerts a force on a second object, the second object exerts a force on the first that is equal in strength and opposite in direction

- “To every action force there is an equal and opposite reaction force”
- One force is not causing the second force – they occur at the same time



- Think about the difference of a bug hitting your windshield while driving down the interstate and a deer.