

Lecture 16, Oct 20, 2021

Momentum and Force

- Force is the rate of change of momentum: $\vec{F} = \frac{d}{dt}m\vec{v}$
- For constant masses this is equal to $\vec{F} = m\vec{a}$
- The acceleration of an object is caused by the net force, i.e. vector sum of all forces on that object
- Since momentum is conserved, $\Delta p_1 = -\Delta p_2 \implies \frac{\Delta p_1}{\Delta t} = \frac{\Delta p_2}{\Delta t} \implies F_1 = -F_2$
- Because of this, forces always come in pairs that are opposite in direction but equal in magnitude

Translational Equilibrium

- An object is in equilibrium if it is not accelerating (this is true for all inertial reference frames since acceleration is the same regardless of reference frame)
- Therefore the object is not subject to any net force
- The object will remain at rest or move at constant velocity