

CHAPTER 7: Impulse & Momentum

Linear momentum: $\vec{p} = m\vec{v}$

Impulse: $\vec{J} = \vec{F}\Delta t$

$$\vec{F} = m\vec{a} \Leftrightarrow \vec{J} = \Delta\vec{p} = \vec{p}_f - \vec{p}_i$$

Conservation of Momentum:

$$\text{if } \Sigma\vec{F}_{\text{ext}} = 0 \Rightarrow \vec{P}_f = \vec{P}_i$$

Elastic collision:

$$v_{f1} = \left(\frac{m_1 - m_2}{m_1 + m_2} \right) v_{10} + \left(\frac{2m_2}{m_1 + m_2} \right) v_{20}$$

$$v_{f2} = \left(\frac{2m_1}{m_1 + m_2} \right) v_{10} + \left(\frac{m_2 - m_1}{m_1 + m_2} \right) v_{20}$$

Center of mass:

$$x_{cm} = \frac{m_1 x_1 + m_2 x_2}{m_1 + m_2}$$

$$v_{cm} = \frac{m_1 v_1 + m_2 v_2}{m_1 + m_2} = \frac{P_{total}}{M_{total}}$$