8.1: Momentum and Impulse

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Definition: (Momentum) **Momentum** is denoted p and is given by

$$\vec{p} = m\vec{v}$$

or the mass of a particle times its velocity. This has a relation with Newton's Second Law:

$$F_{net} = \frac{d\vec{p}}{dt}$$

Definition: (Impulse) The **impulse** of an object $\vec{J}$ is the change in momentum:

$$\vec{J} = \vec{p}_1 - \vec{p}_0 = \Delta\vec{p}$$

It is also the integral of net force with respect to time:

$$\vec{J} = \int_{t_0}^{t_1} \vec{F}_{net} dt = \int_{t_0}^{t_1} \frac{d\vec{p}}{dt} dt = \vec{p}_1 - \vec{p}_0$$

The difference between energy and momentum is that a change in momentum is due to impulse, which depends on the time over which a force acts, whereas changes in energy are due to work, which depends on the distance over which a force acts.