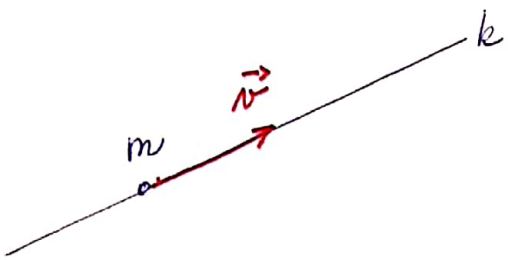
1) Law of change in momentum



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

$\vec{v}$ ... velocity [m/s]
m ... mass of particle [kg]
$\vec{p}$ ... momentum [$kg \cdot \frac{m}{s}$]

2nd Newtons Law $\frac{d\vec{p}}{dt} = \vec{F} \; / dt$

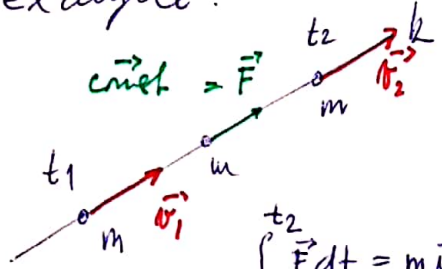
$$\int_{t_1}^{t_2} \vec{F} \cdot dt = \int_{\vec{p}_1}^{\vec{p}_2} d\vec{p}$$

$$\boxed{\int_{t_1}^{t_2} \vec{F}\,dt = \vec{p}_2 - \vec{p}_1 = m\vec{v}_2 - m\vec{v}_1}$$

$\vec{I}_F$ ... impulse of force $\left(\vec{I}_F = \int_{t_1}^{t_2} \vec{F}\,dt\right)$

Impulse of force in time interval from t_1 to t_2 is equal to difference of momentum at the beginning and at the end of the process.

example:



Given: F = const.
v_1 ... initial velocity
m ... mass of particle
$t_2 - t_1$ ... time interval

Task: v_2

$$\int_{t_1}^{t_2} \vec{F}\,dt = m\vec{v}_2 - m\vec{v}_1$$

scalar form: $\int_{t_1}^{t_2} F\,dt = mv_2 - mv_1 \Rightarrow v_2 = \frac{F}{m}(t_2 - t_1) + v_1$