Impulse and Momentum

Linear Momentum

for a particle $\vec{G} = m\vec{v}$ vector quantity

for a system of particles

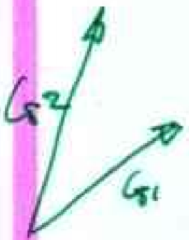
$$\vec{G} = \sum m_i \vec{v}_i$$

note $\vec{v}_i = \dfrac{d\vec{r}_i}{dt}$ $\quad \vec{r}_i$ is pos'n vector of m_i one particle in sys.

$$\therefore \vec{G} = \sum m_i \dot{\vec{r}}_i = \frac{d(\sum m_i r_i)}{dt} \quad \text{for constant mass}$$

$$\Rightarrow \underline{\vec{G} = m\vec{v}_G}$$

$\vec{v}_G$ is velocity of centre of MASS.



Newton's 2nd Law $\vec{F} = m\vec{a}$ can be written

Resultant force $\underline{\sum \vec{F} = \dot{\vec{G}}}$ so $\underline{\int_{t_1}^{t_2} \sum \vec{F}\, dt = \vec{G}_2 - \vec{G}_1}$ vector

we can write scalar equations for components

e.g. $\sum F_x = \dot{G}_x$ & $\int_{t_1}^{t_2} \sum F_x = G_{x_2} - G_{x_1}$ etc for y, z.

$$\boxed{\text{we call } \int_{t_1}^{t_2} \sum \vec{F}\, dt \text{ the linear impulse on the body during the time-interval } t_1 \text{ to } t_2}$$

Linear impulse = change in momentum

$\underbrace{}$

for a given time interval