CH04

Kinetic energy of a particle (remember, this is <u>classical</u> mech.)

$$T = \frac{1}{2} m v^2$$

$$T = \frac{1}{2} m (\vec{v} \cdot \vec{v})$$

Change in T with respect to time is

$$\frac{dT}{dt} = \frac{d}{dt}\left(\frac{1}{2} m \vec{v} \cdot \vec{v}\right) = \frac{1}{2} m \left[(\vec{v} \cdot \dot{\vec{v}}) + (\dot{\vec{v}} \cdot \vec{v})\right]$$

$\vec{A} \cdot \vec{B} = \vec{B} \cdot \vec{A}$ so

$$= \frac{1}{2} m \, 2 \dot{\vec{v}} \cdot \vec{v}$$

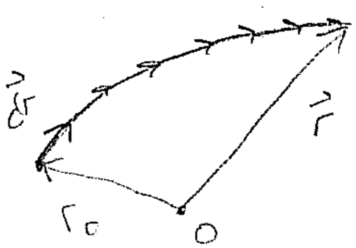
$$= \underbrace{m \dot{\vec{v}}}_{F_{net}} \cdot \vec{v}$$

$$\frac{dT}{dt} = \vec{F}_{net} \cdot \vec{v}$$

$\Rightarrow$ this is called power, units are $\frac{J}{s}$

Change in kinetic energy is $dT = \vec{F}_{net} \cdot \vec{v}\, dt$

$$dT = \vec{F}_{net} \cdot d\vec{r}$$



$$\underbrace{\Delta T = \int_{\vec{r}_0}^{\vec{r}} \vec{F}_{net} \cdot d\vec{r}}_{\text{defined as work}}$$

line integral (or path integral)

$\boxed{\Delta T = W}$ $\equiv$ work-energy theorem