Kinetics of a particle
work and energy

$$dU_{1-2} = F\,dr$$

$$U_{1-2} = \int_{r_1}^{r_2} F\,dr = \int_{s_1}^{s_2} F\,ds$$

$$\Sigma F_{net} = m\vec{a}$$

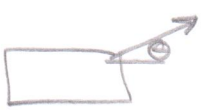
$$\Sigma F_{net} = m v \frac{dv}{ds}$$

$$\int_{s_1}^{s_2} \Sigma F_{net}\,ds = \int_{v_1}^{v_2} m v\,dv$$

$$U_{1-2} = \frac{1}{2} m V_2^2 - \frac{1}{2} m V_1^2$$

for work done

* Const force $\int_{s_1}^{s_2} F\,ds = F\,\Delta s = F(s_2 - s_1)$
* inclined force



$$U_{1-2} = F\cos\theta\,\Delta s$$

* reverse force

$$U_{1-2} = -F\,\Delta s$$

* tangential force

$$U_{1-2} = \int_{s_1}^{s_2} F\,ds = \int_{\theta_1}^{\theta_2} aF\,d\theta$$

* weight $U_{1-2} = \pm mgh$ (+ if down, − if up)
* spring

$$U_{1-2} = \int_{s_1}^{s_2} F(s)\,ds = \int_{s_1}^{s_2} -Ks\,ds$$

$$= -K\left[\frac{s^2}{2}\right]_{s_1}^{s_2} = \frac{-1}{2} K\left(s_2^2 - s_1^2\right)$$