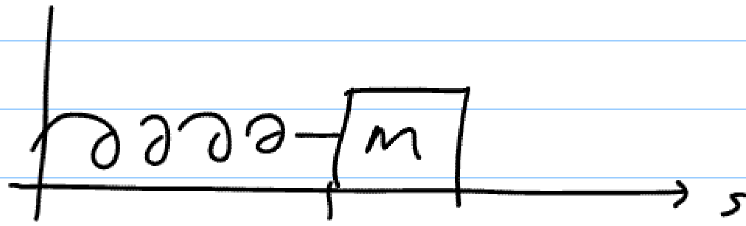
PHY138 Mechanics - Class 11 - Oct. 18/06

§10.4 & §10.5 Springs



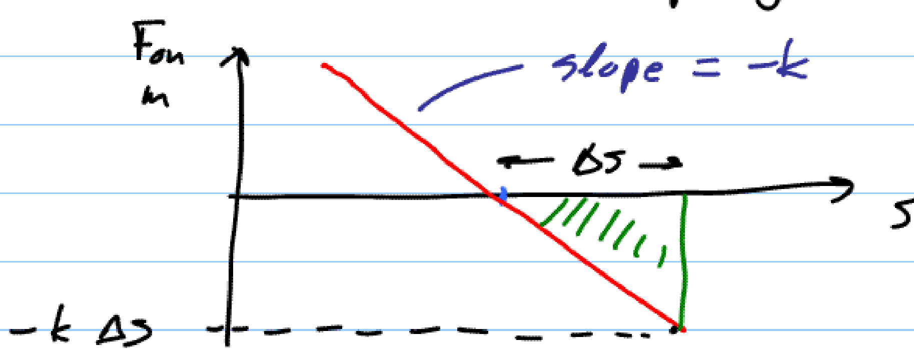
s_e - equilibrium

$F_{\text{on } m} = 0$

At position s $\quad F_{\text{on } m} = -k\,\Delta s$

$\Delta s \equiv (s - s_e)$

Elastic Potential Energy U_s
stored in spring



$$\boxed{U_s + K \quad \text{constant}}$$

Magnitude of area $= \frac{1}{2}$ base × height

$= \frac{1}{2} \Delta s \, k \, \Delta s = \frac{1}{2} k \Delta s^2$

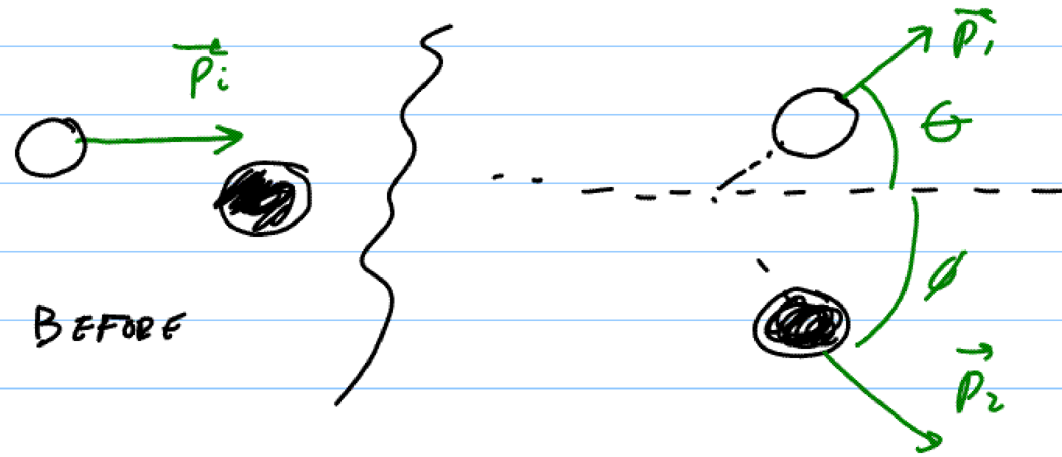
$$\boxed{U_s = \frac{1}{2} k \Delta s^2}$$

for all Δs

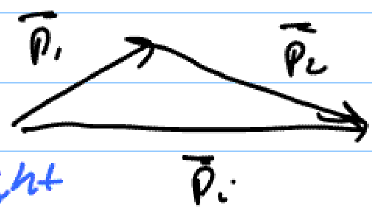
§10.6 - Elastic Collisions

total K before & after constant

Example Billiards balls: mass m



$$\vec{p}_i = \vec{p}_1 + \vec{p}_2$$



right triangle

$$K_i = K_1 + K_2$$

$$\frac{p_i^2}{2m} = \frac{p_1^2}{2m} + \frac{p_2^2}{2m}$$

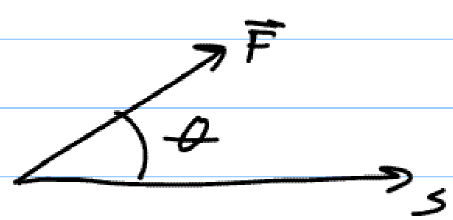
$$\therefore \quad \underline{p_i^2 = p_1^2 + p_2^2}$$

$$\theta + \phi = \frac{\pi}{2} \text{ radians} = 90^\circ$$

$\boxed{\text{CHAPTER 11}}$

Work $W \equiv \int F\,ds = \Delta K$

Constant force $F \Delta s = \Delta K$



$$F_s = F\cos\theta$$

$$\underline{W = Fs\cos\theta}$$

$W = \int \vec{F} \cdot d\vec{s} \quad \left(\begin{matrix} \text{const } F \\ \vec{F} \cdot \Delta \vec{s} \end{matrix} \right)$

§11.5 $\quad W_{net} = \Delta K = -\Delta U$

Gravity: W independent of path

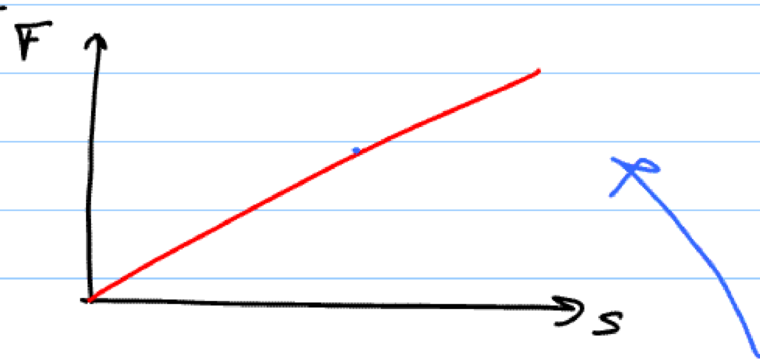
$\boxed{U \text{ is the potential for work to be done}}$

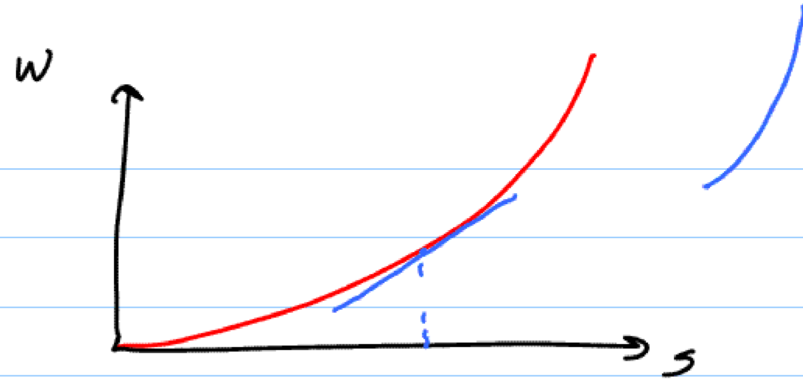
Conservative: (e.g. gravity springs)

Non-conservative (eg. friction)

U can not be defined

§11.6 $\quad F$ & U





$$F = \frac{d\overline{W}}{ds}$$

$$\boxed{F = -\frac{dU}{ds}}$$

<u>Loose End</u> $\overline{W} = F\Delta s = \Delta K$

Constant force: maximise W by maximising Δs