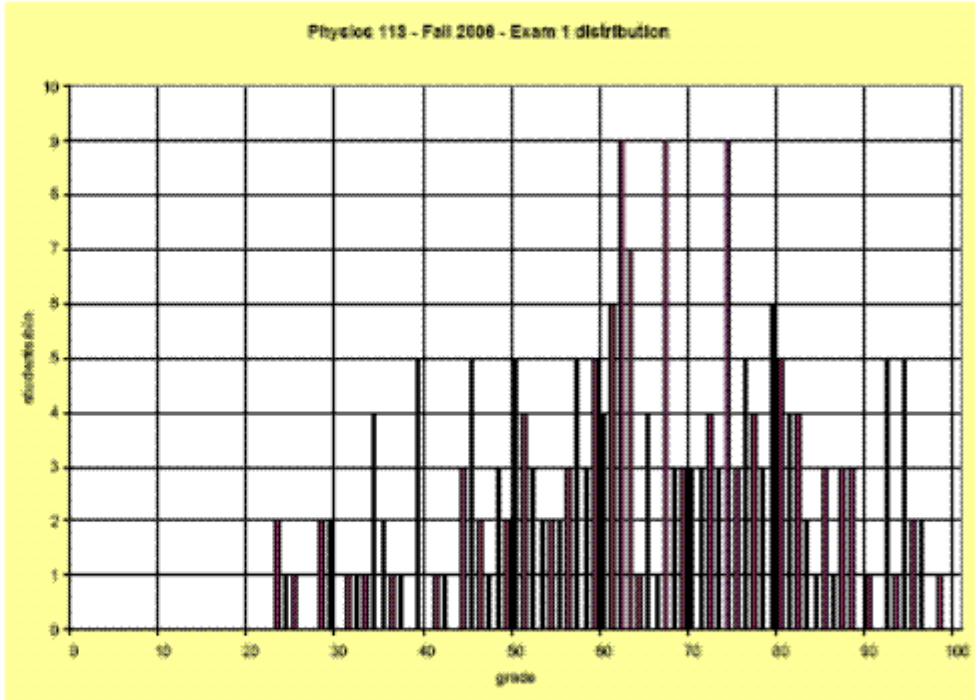
Physics 113 - October 12, 2006

Work - Energy

- Exam Graded

mean = 64



- No workshops Monday → go to another section
  (will be held the rest of week)
- No Labs Next Week

Last time -

Important

$$\text{Work} = \vec{F} \cdot \vec{S}$$

for CONSTANT force
+
Movement in STRAIGHT line

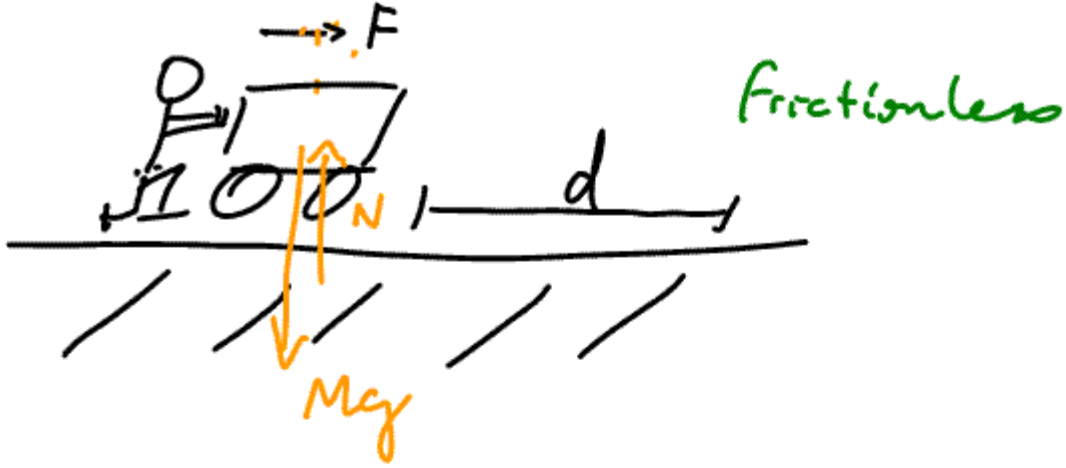
Important

$$\text{Work} = \int_{S_{start}}^{S_{end}} \vec{F} \cdot d\vec{s}$$

dot product or scalar product

$$\vec{A} \cdot \vec{B} = |\vec{A}||\vec{B}|\cos\theta = A_x B_x + A_y B_y + A_z B_z$$

Important



$$F = Ma \longrightarrow a = F/M$$

Exert F over distance d

$$\text{Work} = Fd$$

$$v^2 = v_0^2 + 2a(x - x_0)$$

$v_0 \rightarrow 0$, $(x - x_0) \rightarrow d$

$$v^2 = 2ad = 2\frac{F}{M}d$$

Work done

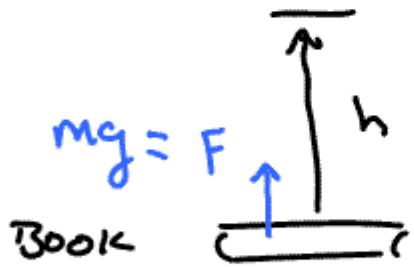
$$\text{Work} = \frac{1}{2}MV^2$$

General Def.

$$\text{Kinetic Energy} = \frac{1}{2}MV^2$$

↳ Energy of motion

Example



let go

Work done by me to lift Book dist h

$W = Fd = mgh$

$v^2 = v_0^2 + 2ah$

$v^2 = 2gh$

$\frac{1}{2}mv^2 = \frac{1}{2}m2gh = mgh$

SAME

— Potential energy of mgh

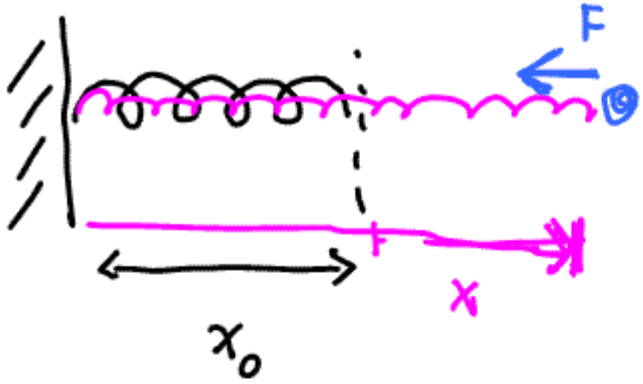
Path independent

Conservative Force ...

E_{TOTAL} is Conserved

$$\sum_i E_{Initial} = \sum_j E_{Final}$$

Two forms of energy may change



stretch spring

$F \propto x - x_0$

Magnitude eqn

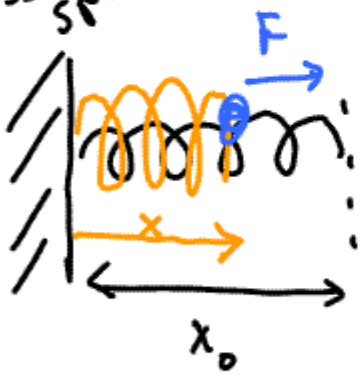
$F = K(x - x_0)$

Spring Constant

natural length

Δx

compress spring



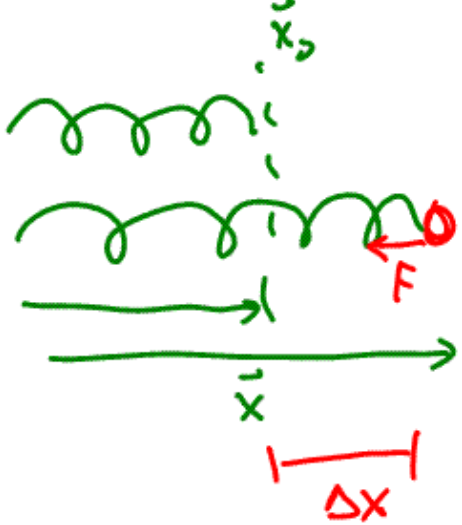
Δx

$F \propto |(x - x_0)|$

$F = K|(x - x_0)|$

restoring force

$\vec{F} = -K(\vec{x} - \vec{x}_0)$

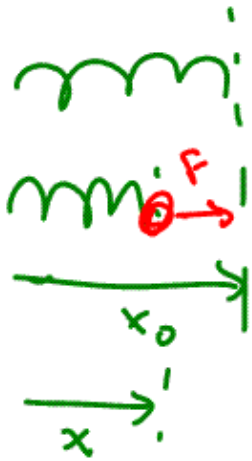


$\vec{x} - \vec{x}_0$ is $\vec{\Delta x}$ +

$\vec{F} = -k\,\vec{\Delta x}$

+x

restoring force



$\vec{F} = -k\,(\vec{x} - \vec{x}_0)$

Pushes back toward center

H_2 Molecule

can model chemical bonds as springs