Work + Energy

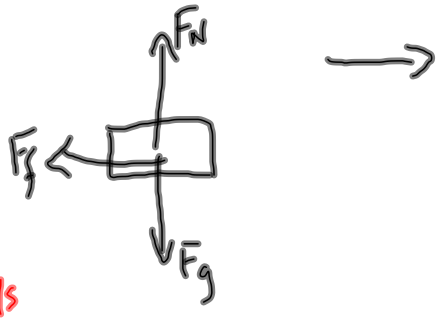
$W = F_{\parallel} \Delta d$

$W = F \Delta d \cos\theta$

W is area under F-d graph

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

$W = \Delta E_k$



From HW (pp 246)

26. $m = 1260\ kg$

$v_1 = 25\ km/h = 6.9\ m/s$

$v_2 = 0$

$\Delta d = 10\ m$

$F_f = ?$

$W = \Delta E_k$ (work-energy theorem)

$F_f \Delta d \cos\theta = E_{k2} - E_{k1}$

$F_f \Delta d \cos\theta = -E_{k1}$

$$F_f = \frac{-E_{k1}}{\Delta d \cos\theta}$$

$$F_f = \frac{-\frac{1}{2} m v_1^2}{\Delta d \cos\theta}$$

$$F_f = \frac{\frac{1}{2}(1260\ kg)(6.9\ m/s)^2}{(10\ m)(\cos 180^\circ)}$$

$F_f = 3.0 \times 10^3\ N$ ← the magnitude of F_f

§6-3 Potential Energy & Work-Energy Theorem

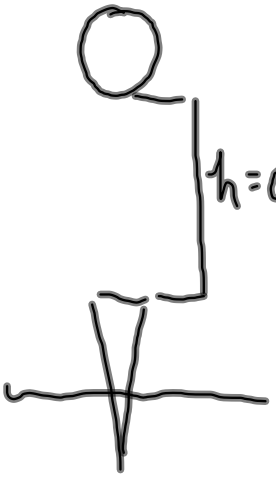
gravitational potential energy - stored energy due to an object's position above a reference level.

$$E_g = mgh$$

where E_g is the gravitational potential energy (J)
m is the mass (kg)
g is $9.81 m/s^2$ (near surface of Earth)
h is the height above a certain reference level (m)

MP/249

$m = 3.0 kg$
$h = 0.68 m$
$E_g = ?$



$E_g = mgh$

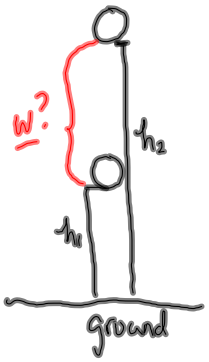
$E_g = (3.0 kg)(9.81 m/s^2)(0.68 m)$

$E_g \doteq 2.0 \times 10^1 J$

The rock has 2.0×10^1 J of PE relative to the tent peg.

Gravitational Potential Energy & Work.

Consider lifting an object from h_1 to h_2:



$W = F_{||}\,\Delta d$

$W = F_a\,\Delta d$

$W = F_g\,\Delta d$

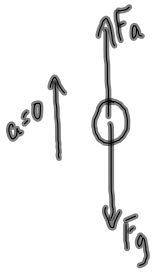
$W = mg\,\Delta d$

$W = mg(h_2 - h_1)$

$W = mgh_2 - mgh_1$

$W = E_{g_2} - E_{g_1}$

$\boxed{W = \Delta E_g}$



WORK-ENERGY THEOREM

* Work is equal to the change in gravitational potential energy.

MP|252

$m = 65.0\,kg$

$W = 1.60 \times 10^4\,J$

$\Delta h = ??$

$W = \Delta E_g$ (Work-Energy Theorem)

$W = E_{g_2} - E_{g_1}$

$W = mgh_2 - mgh_1$

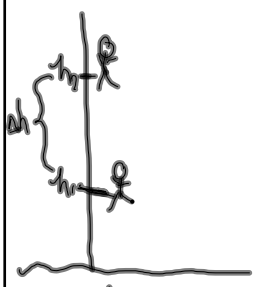
$W = mg(h_2 - h_1)$

$W = mg\Delta h$

$\Delta h = \frac{W}{mg}$

$\Delta h = \frac{1.60 \times 10^4\,J}{(65.0\,kg)(9.81\,m/s^2)}$

$\boxed{\Delta h = 25.1\,m}$



The climber ascended 25.1m

TO DO

① PP|250

② PP|254

③ Assignment due tomorrow!

Nov 24-9:29 AM