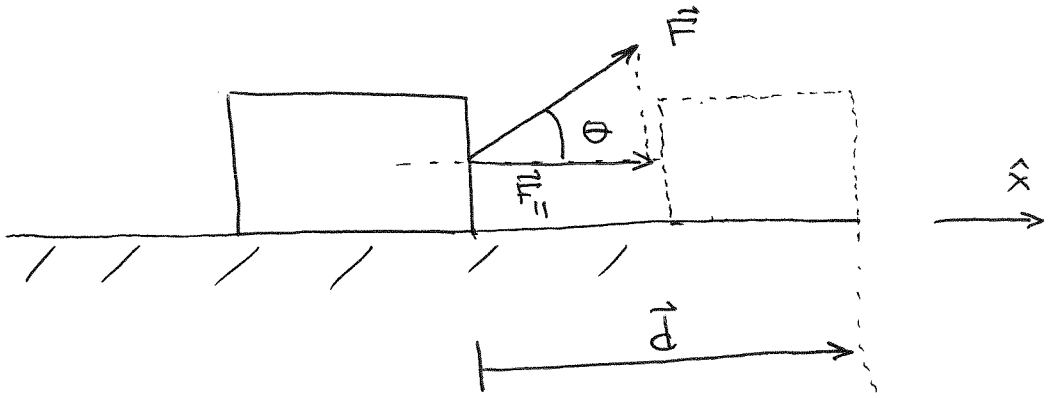
WORK AND ENERGY

WORK => "FORCE ACTS THROUGH DISTANCE"

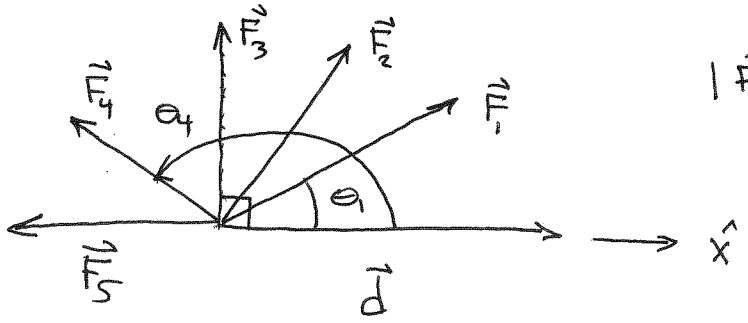
WORK Changes KE.

Definition



$$W = |\vec{F}||\vec{d}|\cos\theta \qquad \vec{F}_{\parallel} = |\vec{F}|\cos\theta\,\hat{x}$$

$$|\vec{F}_i| \equiv F$$



$$W_1 > W_2 > W_3 \equiv 0 > W_4$$

$\uparrow$ $\cos\theta_3 = \cos 90^\circ \equiv 0$

$W_4 < 0 \Rightarrow$ NEGATIVE $\Rightarrow \cos\theta_4 < 0$

COSINE IS NEGATIVE IN 2nd QUADRANT

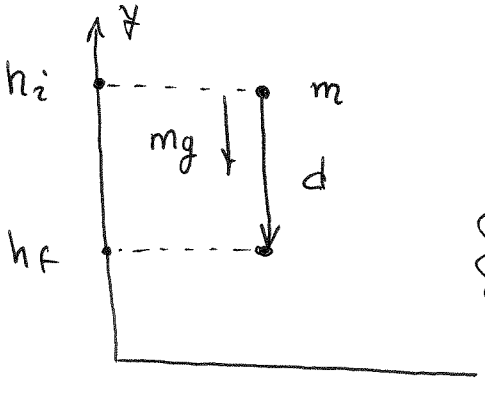
$\vec{F}_1$, F_2, DO POSITIVE WORK $\vec{F}_3$ does $\not{0}$ WORK

$\vec{F}_4$ AND $\vec{F}_5$ do NEGATIVE WORK

WORK ENERGY THEOREM:

$$W_{Net} = \Delta KE = KE_f - KE_i \equiv \frac{1}{2} m v_f^2 - \frac{1}{2} m v_i^2$$

GRAVITATIONAL POTENTIAL ENERGY

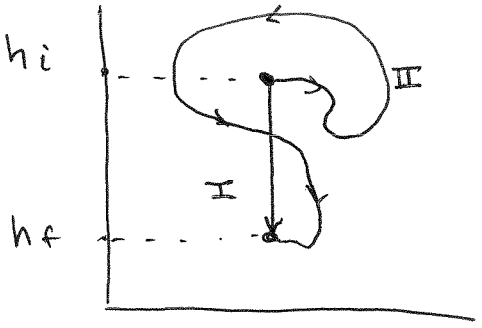


$$W_g = F_g d \cos 0^\circ \qquad d = h_i - h_f$$

$$\boxed{W_g = mg(h_i - h_f)}$$

$$W_g = mgh_i - mgh_f \qquad \boxed{PE \equiv mgh}$$

$W_g = PE_i - PE_f$ => Depends only on the End Points OF The Path connecty the INITIAC AND FINAL POINTS ≡ CONSERVATIVE FORCE



$$\boxed{W_{II} = W_I}$$

IF ONLY GRAVITY ACTS =>

$$W_{net} = \underbrace{PE_i - PE_f}_{W_g} = \Delta KE = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$$\Rightarrow \quad PE_i + KE_i = PE_f + KE_f$$

$$\underbrace{mgh_i + \frac{1}{2}mv_i^2}_{\text{TOTAL MECHANICAL ENERGY}} = mgh_f + \frac{1}{2}mv_f^2$$

=> Conserved if only GRAVITY ACTS

SUPPOSING ADDITONAL WORK gets Done by OTHER (NON CONSERVATIVE) FORCES =>

$$W_{net} = W_g + W_{NC} = \Delta KE = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$$\overbrace{\underbrace{PE_i - PE_f}_{W_g} + W_{NC}}^{W_{net}} = \frac{1}{2}mv_f^2 - \frac{1}{2}mv_i^2$$

$$PE_i + KE_i + W_{NC} = \frac{1}{2}mv_f^2 + KE_f + PE_f$$

$$\boxed{mgh_i + \frac{1}{2}mv_i^2 + W_{NC} = \frac{1}{2}mv_f^2 + mgh_f}$$