

7.1: Gravitational Potential Energy

Alex L.

October 19, 2024

Definition: (Potential Energy) Energy associated with position is called **potential energy**.

Proposition: $W_{grav} = \vec{F} \cdot \vec{s} = \vec{F}_g(y_1 - y_2 = mgy_1 - mgy_2)$

The above derivation shows that when an object moves upward, negative work is done, and potential energy increases, and when a body moves downwards, positive work is done, and potential energy decreases.

$$U_{grav} = mgy$$

$$W = -\Delta U_{grav}$$

Theorem: (Conservation of Mechanical Energy) If the only force doing work on a system is gravity, then mechanical energy is conserved, in other words:

$$K_0 + U_0 = K_1 + U_1$$

If forces other than gravity do work, then our equation becomes

$$K_0 + U_0 + W = K_1 + U_1$$

Proposition: (Gravitational Potential Energy along a Curved Path) Remember that $-\Delta U_{grav} = W$, so $m\vec{g} \cdot \vec{s} = -\Delta U_{grav}$. This means we only consider the component of displacement that is inline with the force of weight.