Physics Recap - Energy

Kinetic energy - Energy an object has because it is in motion

Example: A drop of rain falling

Example: A wheel spinning.

Physics Recap - Energy

Potential Energy - Energy an object has stored as a result of its position.

Example: A person holding a coin above the ground. When the coin is dropped, the potential energy is converted to kinetic energy and the coin falls.

Example: The voltage measured across the terminals of a battery.

Physics Recap - Hamiltonian

$$H(q,p) = K + U$$

Q = position

P = Momentum (p = mv), where m = mass.

Physics Recap - Hamiltonian

$$H(q,p) = K + U$$

$$\frac{dp}{dt} = -\frac{\partial H}{\partial q} \qquad \frac{dq}{dt} = \frac{\partial H}{\partial p}$$

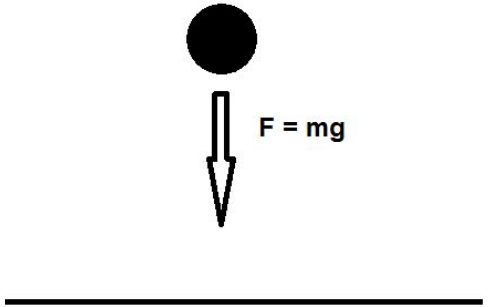
Physics Recap - Hamiltonian Example

Example: Object in free fall

$$H = K + U$$

$$H = \frac{1}{2}mv^2 + mgh$$

$$H = \frac{p^2}{2m} + mgq$$



Physics Recap - Hamiltonian Example

$$H = \frac{p^2}{2m} + mgq$$

$$\frac{dp}{dt} = -\frac{\partial H}{\partial q} \qquad \frac{dq}{dt} = \frac{\partial H}{\partial p}$$

$$\frac{dp}{dt} = -mg \qquad \frac{dq}{dt} = \frac{p}{m}$$

Physics Recap - Hamiltonian Example

$$H = \frac{p^2}{2m} + mgq$$

$$\frac{dp}{dt} = -\frac{\partial H}{\partial q} \qquad \frac{dq}{dt} = \frac{\partial H}{\partial p}$$

$$\frac{dp}{dt} = -mg \qquad \frac{dq}{dt} = \frac{p}{m}$$

$$\frac{d(mv)}{dt} = -mg \qquad v = \frac{p}{m}$$

$$ma = -mg \qquad v = \frac{mv}{m}$$

$$a = -g \qquad v = v$$

Which we already know!