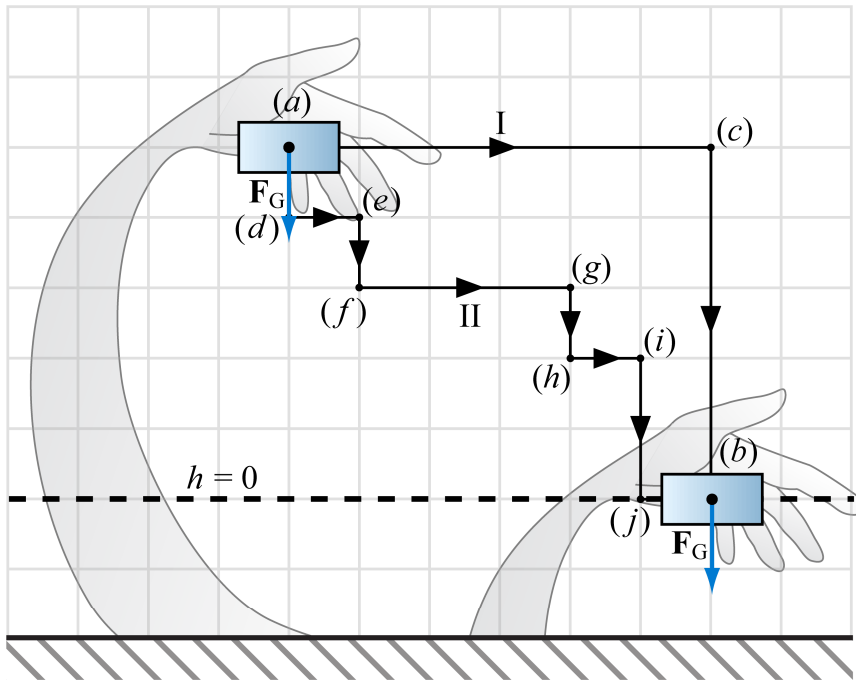# Potential energy

The work that a given force would perform on an object along a path from the object's present position to a **reference position** might be independent of path. In such a case, this work is called the **potential energy** (associated with the force) at the object's current position.
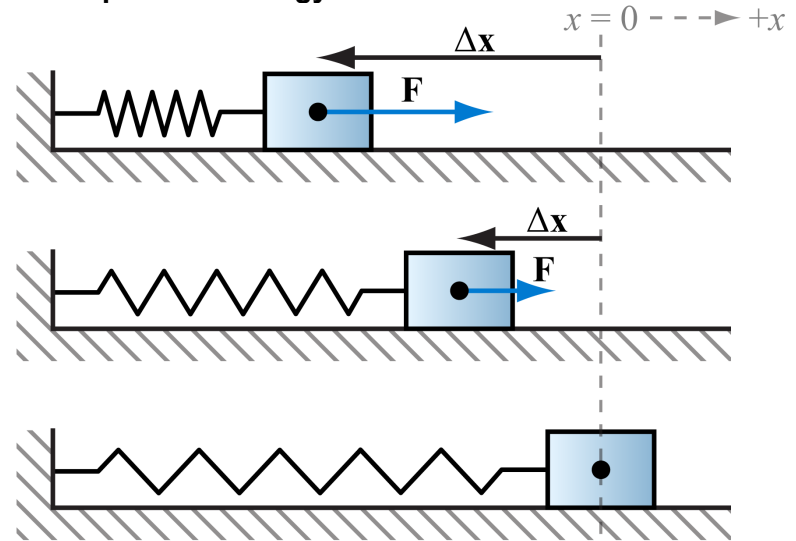
$$\Delta U_{\mathrm{F}} := -\Delta W_{\mathrm{F}}$$

Gravitational potential energy near the surface of the Earth

$$\Delta U_{\mathrm{G}} = mg\Delta h$$

Elastic potential energy

Consider the work that the spring force would perform while pushing back from an initial distance of $|\Delta \vec{x}|$ to a final distance of $|\Delta \vec{x}| = 0$.

$$\Delta U_{\mathrm{S}} = \frac{1}{2} k (\Delta x)^2$$