PHYS 210 - General Physics I

- Conservation of Energy
- Work

MECHANICAL ENERGY CONSERVATION

Two equivalent perspectives on conservation of mechanical energy (of isolated system with only “conservative” force interactions):

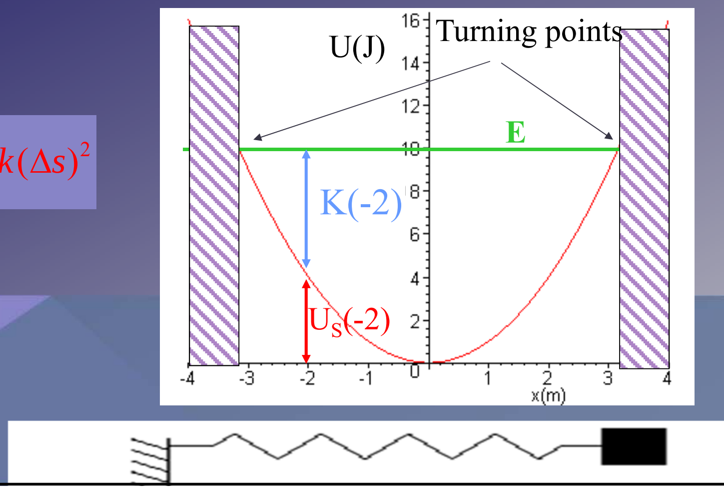
$$E_{mech1} = K_1 + U_1 = E_{mech2} = K_2 + U_2$$

OR

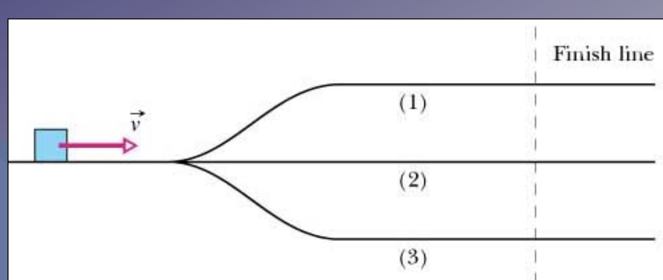
$$\Delta E_{mech} = \Delta K + \Delta U = 0$$

VISUALIZING E CONSERVATION VIA POTENTIAL ENERGY CURVES

$$U_s = \frac{1}{2}k(\Delta s)^2$$



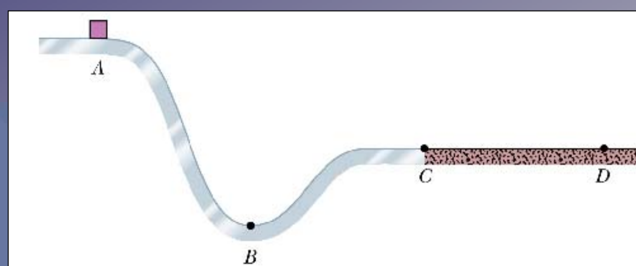
A horizontally moving block can take three frictionless routes, differing only in elevation, to reach the dashed finish line. Rank the routes according to (a) the speed of the block at the finish line and (b) the travel time of the block to the finish line, greatest first.



TRY THIS:

A block slides from A to C on a frictionless ramp. Then is moves along a region with friction from C to D. what is happening to the block's kinetic energy from (a) A to B? (b) B to C? (c) C to D?

What is happening to the block's "mechanical energy" in those three regions?



Work

Loosely speaking, work is a measure of "how productive" a force is. It is the energy transferred to/from an object via a force.

The most general definition is:

$$W = \int \vec{F} \cdot d\vec{r} \quad \text{where} \quad d\vec{r} = \hat{i}dx + \hat{j}dy + \hat{k}dz$$

- For constant forces,

where $W = \vec{F} \cdot \vec{r}$

- Power, P, is the rate at which work is done:

P = dW/dt

Happy Wednesday!