Conservation of Energy

With friction!

Conservation of Energy with Friction

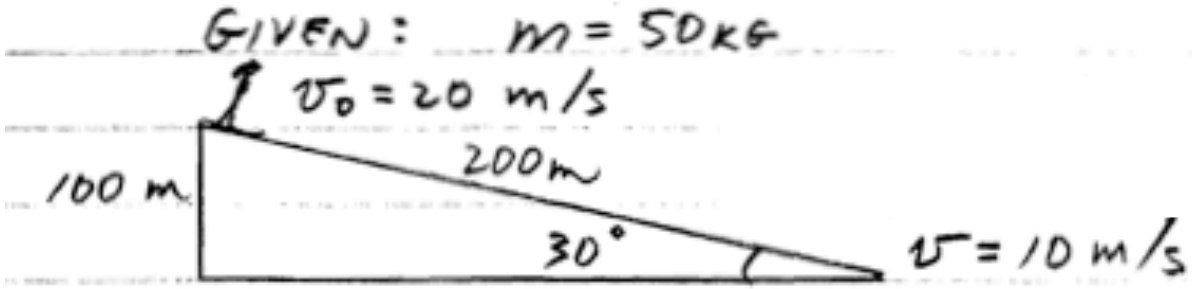
$$E_0 \pm W_{nc} = E_f$$

$$U_0 + K_0 \pm work = U + K$$

- + work = energy added to the system by an engine
- - work = energy taken away by friction

- When the only forces acting on an object are gravity or the spring force, the total mechanical energy of the system stays constant.
- BUT when a frictional force acts on an object, the final mechanical energy will be less than the initial.
- This is because some of the initial mechanical energy gets converted to thermal energy.
- Thermal energy = work done by friction $W = F_f d$

Ex: Andrea skis down an inclined plane. Given:



1. Find the work done by force of friction.

2. Find F_f

3. Find F_N

4. Find the coefficient of friction.

Ex: A 1500 kg car is pushed down a 30 m long icy hill with an initial speed of 4 m/s. The hill is sloped at an angle of 30^0 to the horizontal and an average frictional force of 1200 N impedes the car's motion as it descends.

A) How fast is the car moving at the bottom of the hill?

B) At the bottom of the hill, the car travels 88 m along snow covered, flat ground before coming to rest. What is the coefficient of sliding friction between the car and the ground?