Today's Concepts:

a) Energy and Friction
b) Potential energy & force
I thought this was pretty intuitive

I think I still need more examples with friction, and blocks going down ramps.

These equations are confusing me and how they work with positive and negatives.

I seem to be having a hard time with the graphs, again.

Way too many formulas not enough examples using numbers.

A deeper discussion on the derivations of some of the more complex formulas that were shown in the prelecture.

The Drawing from the Energy over distance graph is not that nice looking so I might need help on this one.

Ok
A block of mass $m$, initially held at rest on a frictionless ramp a vertical distance $H$ above the floor, slides down the ramp and onto a floor where friction causes it to stop a distance $r$ from the bottom of the ramp. The coefficient of kinetic friction between the box and the floor is $\mu_k$. What is the macroscopic work done on the block by friction during this process?

A) $mgH$  
B) $-mgH$  
C) $\mu_k mgD$  
D) 0
In Terms of Work and KE

\[ \Delta K = W_{\text{tot}} = W_{\text{gravity}} + W_{\text{friction}} \]

\[ 0 = W_{\text{gravity}} + W_{\text{friction}} \]

\[ 0 = mgH + W_{\text{friction}} \]

must be negative
OR ...in Terms of Change in ME

\[ W_{NC} = \Delta ME \]

\[ W_{NC} = \Delta PE + \Delta KE \]

\[ W_{NC} = PE_F - PE_O \]

\[ W_{NC} = 0 - mgh \]

must be negative
A block of mass $m$, initially held at rest on a frictionless ramp a vertical distance $H$ above the floor, slides down the ramp and onto a floor where friction causes it to stop a distance $D$ from the bottom of the ramp. The coefficient of kinetic friction between the box and the floor is $\mu_k$. What is the total macroscopic work done on the block by all forces during this process?

A) $mgH$  
B) $-mgH$  
C) $\mu_k mgD$  
D) 0

\[ \Delta K = W_{tot} \]
Potential Energy vs. Force

\[ F(x) = -\frac{dU(x)}{dx} \]

\[ F_{\text{grav}} = -\frac{d(mgy)}{dy} \]

\[ = -mg \]
Potential Energy vs. Force

\[ U(x) = \frac{1}{2} kx^2 \]

\[ F(x) = -\frac{dU(x)}{dx} \]

\[ = -kx \]
A mass, $m=5.8\text{kg}$, hangs on the end of massless rope of length $1.9\text{m}$. The pendulum is held horizontal and then released.

(a) What is its velocity at the bottom of its swing?

(b) What is the tension in the string bottom of its swing?
Example 9.2 (Mass on String II)

Now a peg is placed 4/5 of the way down the pendulum’s path so that the mass falls to its vertical position, hits it and wraps around the peg.

(a) What is the velocity of mass when it’s directly above the peg?

(b) What is the tension in the string at this point?