Physics 2111
Unit 9

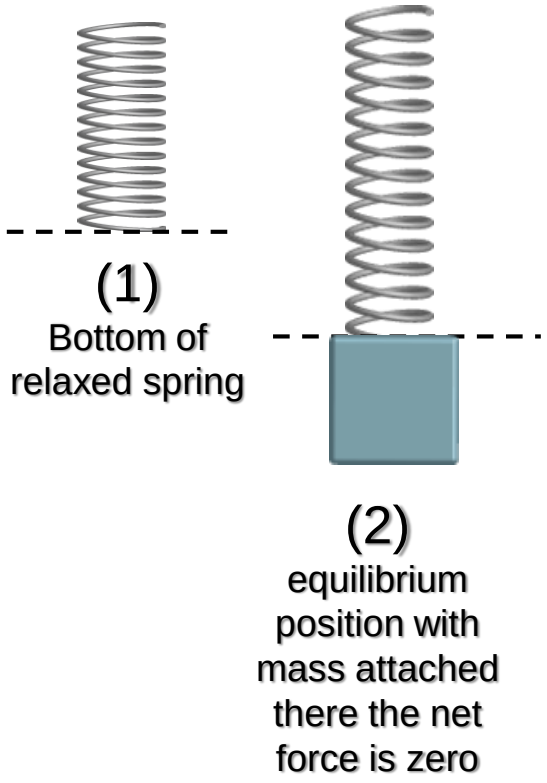
Today's Concepts:

a) Energy and Friction

b) Potential energy & force

Question

Which of the following would be a correct method to calculate the PE of the box and spring?



a) Use (1) for PE=0 and include two different PE terms
b) Use (2) for PE=0 and include two different PE terms
c) Use (1) for PE= 0 and include only one PE term
d) Use (2) for PE=0 and include only one PE term
e) Both answers (a) and (d)

More problems with friction would be useful.

The block sliding down the ramp and going through friction, its total work would be zero right?

Potential energy curves

unstable equilibrium example problems

Please Explain: 1) Derivation of F(x) = -d/dx U(x) equation 2) How Potential Energy Graph correlates to the motion of an object Also does the Area under the F(x) vs x graph represent Potential NRG?

How to read Potential Energy Function graphs

Thanos voice we got this guy

Please explain these concepts more in class, and have more examples done in class.

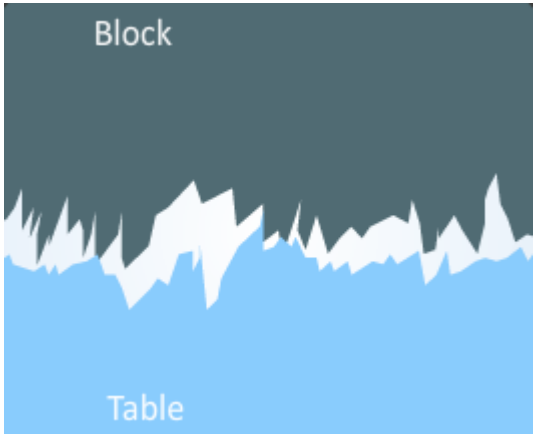
This lecture made sense to me.

Going over the first checkpoint problem about the block sliding down the ramp in class would be helpful. Kind of confused as to why the work done by friction in that problem is different from the pre-lecture problem.

What's up with this "macroscopic work"?

No big deal.

They're just trying to explain to you how friction works.

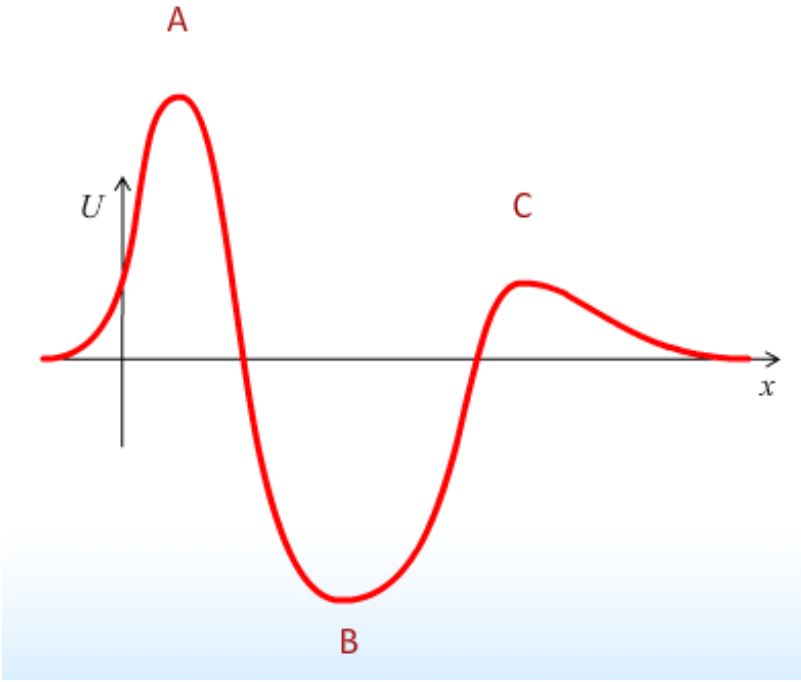


"The good news is we don't have to know anything about these details to calculate the macroscopic motion of the box"

Macroscopic Work ← → Work we calculate normally

Potential Energy vs. Force

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

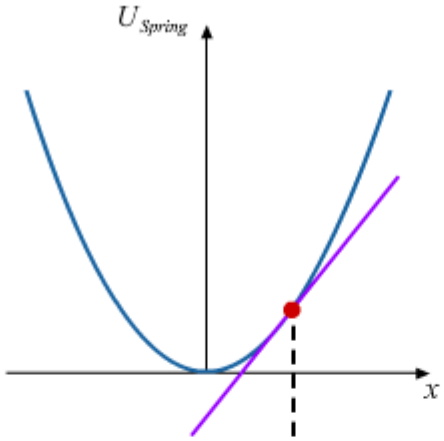


For example:

$$F_{grav} = -\frac{d(mgy)}{dy}$$

$$= -mg$$

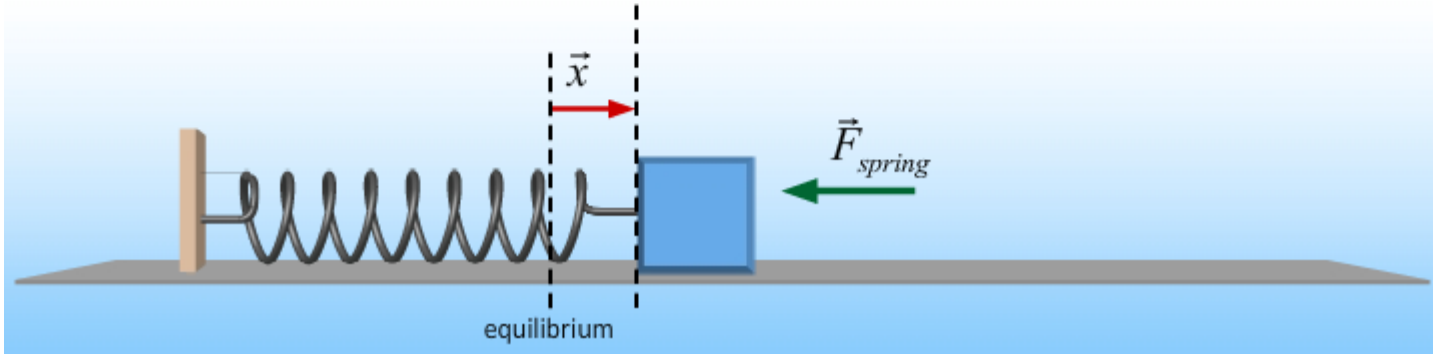
Potential Energy vs. Force



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

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

$$= -kx$$

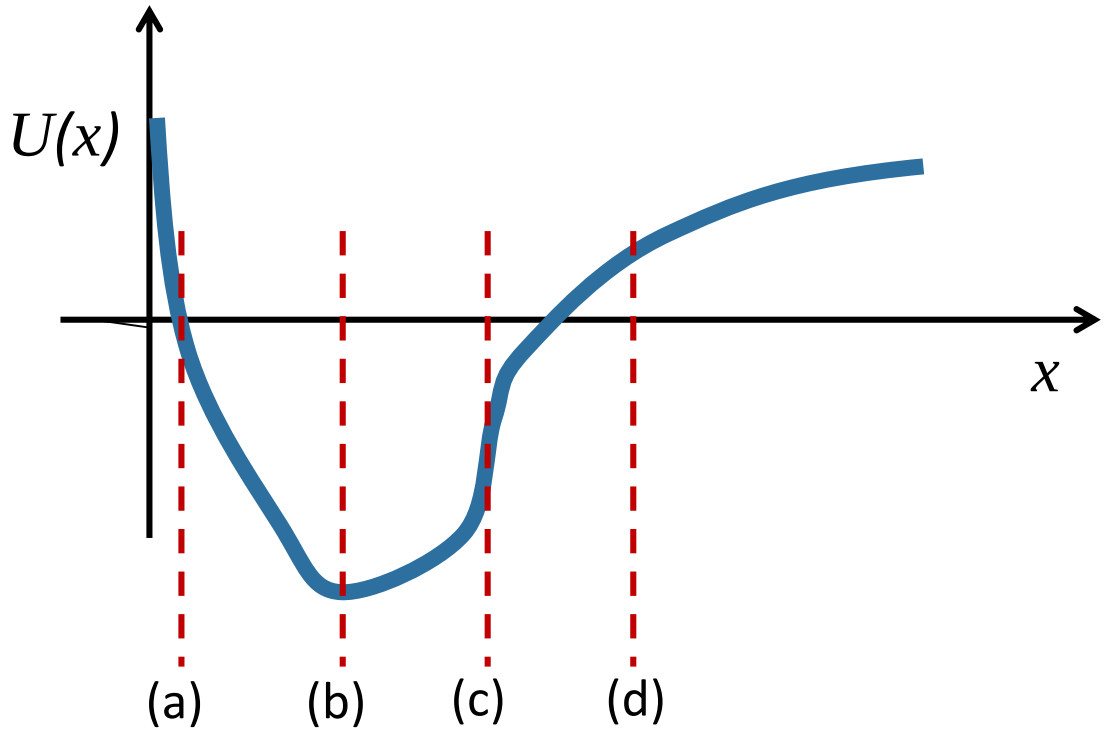


Question

Suppose the potential energy of some object U as a function of x looks like the plot shown below.

Where is the force on the object zero?

A) (a) B) (b) C) (c) D) (d)



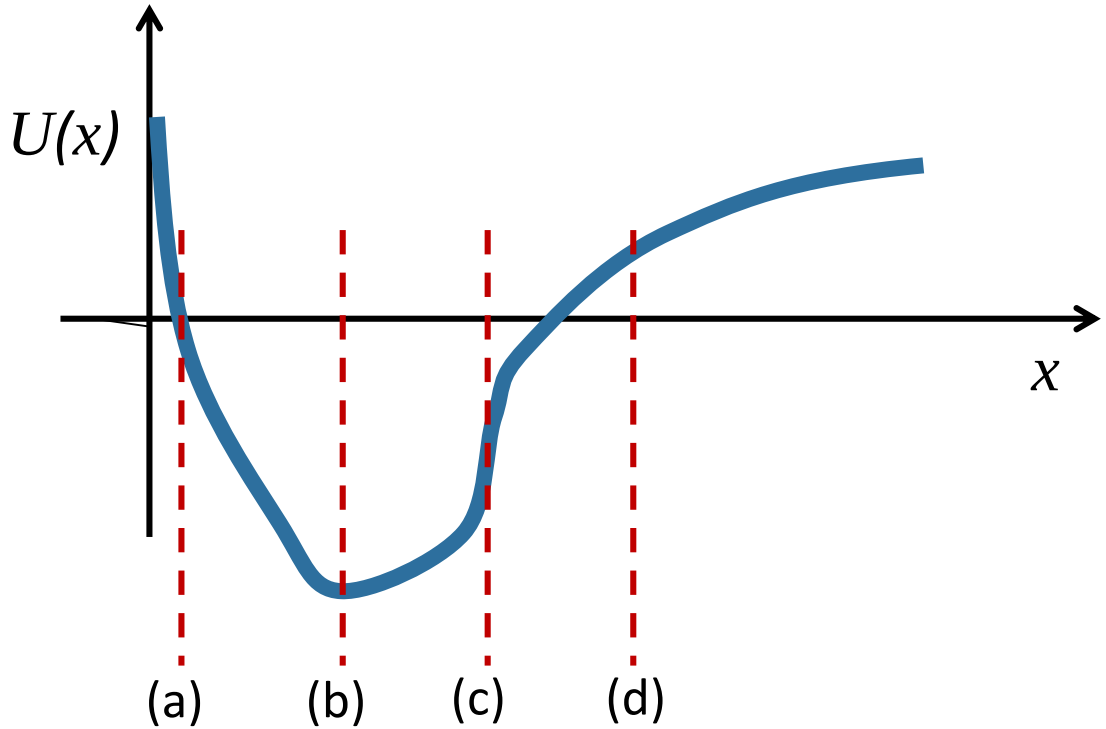
$$F(x) = -\frac{dU(x)}{dx}$$

Question

Suppose the potential energy of some object U as a function of x looks like the plot shown below.

Where is the force on the object in the $+x$ direction?

A) To the left of (b) B) To the right of (b) C) Nowhere



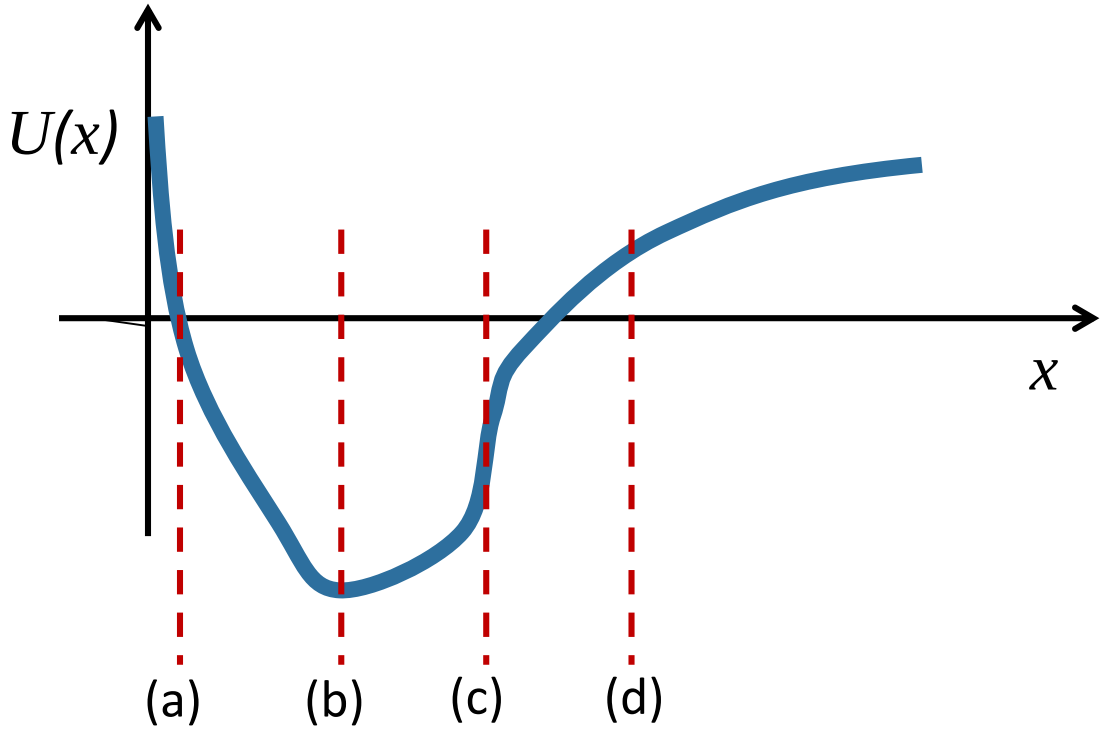
$$F(x) = -\frac{dU(x)}{dx}$$

CheckPoint

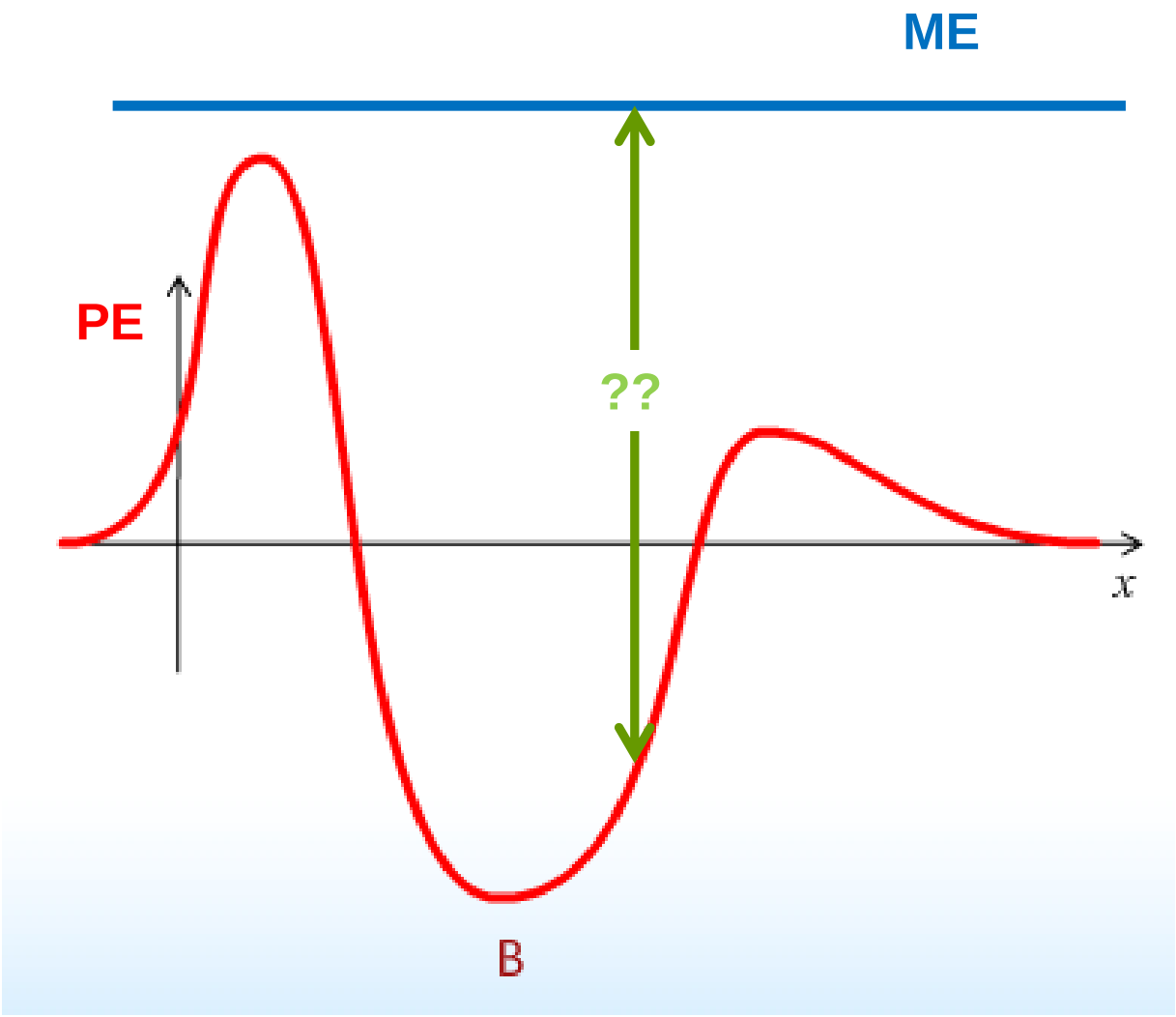
Suppose the potential energy of some object U as a function of x looks like the plot shown below.

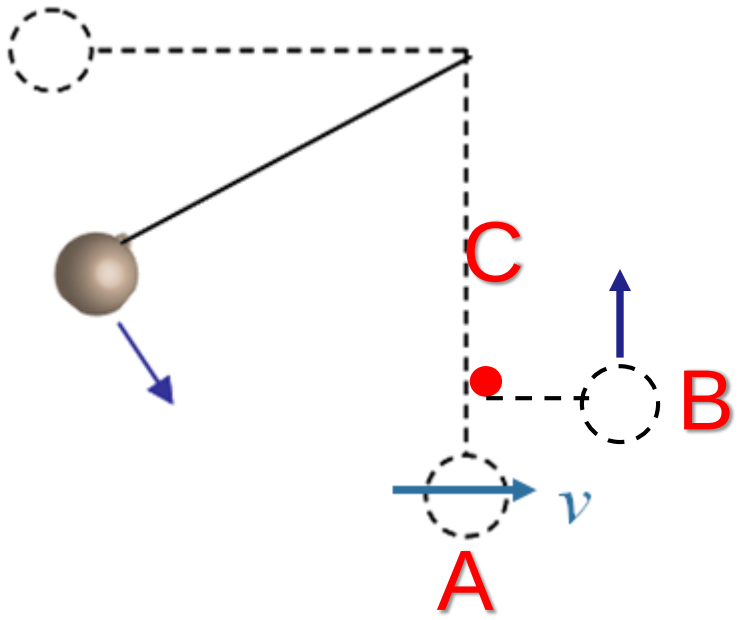
Where is the force on the object biggest in the $-x$ direction?

A) (a) B) (b) C) (c) D) (d)



More on Potential Energy Graph



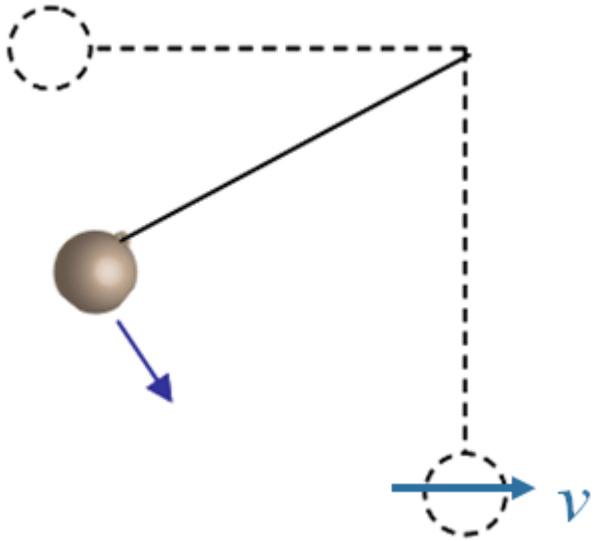


A pendulum consists of a mass attached to a string of length L. The mass is released and at the bottom of its swing, the string hits a little red peg placed 4/5 of the down the pendulum's path so that the mass around the peg.

Where is the velocity of the mass the greatest?

a) position A (at the bottom of the swing)
b) position B (after the mass has started to wrap around the peg and the string is horizontal)
c) position C (after the mass has started to wrap around the peg and the mass is directly above the peg)

Example 9.1 (Mass on String)

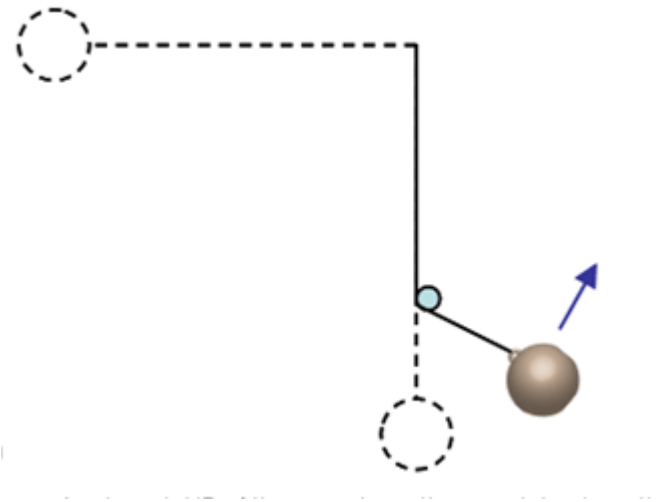


A mass, m=5.8kg, hangs on the end of massless rope of length 1.9m. The pendulum is held horizontal and then released.

(a) What is it's 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 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?