HIP 7 Ph 211—Fall 2018

A mass is attached to a spring such that it can slide back and forth horizontally on a frictionless surface. Experimentally, it was determined that when the spring is compressed or stretched a distance Δs it pushes or pulls back with a force proportional to the Δs in a way that can be described with the equation F = -k(Δs).

1. Find the amount of energy that goes into compressing the spring a distance Δs from its equilibrium state by using the definition of Work.
2. Draw a Force vs. Distance graph for the spring starting at equilibrium and stretched a distance Δs. Find the area of the graph.
3. Create a VPython program that uses a spring with k = 515 N/m compressed to 4.6 cm to find the speed of a 405 grams mass at the point where the spring is no longer compressed.
4. As a reasonableness test compare your results from part a, part b and part c.
5. You use a spring with k = 515 N/m compressed 4.6cm to launch a mass of 405 grams out of a projectile launcher. As soon as the mass leaves the launcher, it slides 98cm along a 1.0 meter tall table that has a coefficient of friction of μk=0.12. How far from the edge of the table does the mass land?

**Chapter 9:**

We are now going to discover that we have been doing things the hard way this entire term. Conservations Laws are going to make our lives easier. There are certain quantities in the Universe which can’t be created or destroyed but they can be transferred from one place to another. We call these quantities Conserved. Some Conserved Quantities include: mass, energy, linear momentum, angular momentum, and electric charge. In Ph 299 we will discover that there is a bit more going on with mass and energy and that there are other semi-conserved quantities like strangeness, lepton number, hypercharge and more.

For this chapter, we are going to start with the concept of Work.

**New equation introduced:**

***Main Problem Solving Strategies Discussed --*** we will add a possible short-cut to our standard “to do” list:

1. Draw a picture!
2. Set up a “good” coordinate system
3. If you can use energy, you **might** get to skip d, e, f and g and go straight to deriving your energy equations.
4. Make sure that you analyze each dimension
5. Draw a FBD *for every body in the problem.*
6. Create an equation using Fnet = manet *for* every body in the problem. If the object is undergoing constant circular motion then Fnet = Fc.
7. Always check to see if you have constant accelerations or changing accelerations.