

Homework 6, Kansas State University PHYS522, Mechanics Due: Thursday March 8, 2007 at beginning of class

The problems we will be doing are becoming more difficult, so to do well you will need to

1. Read the book before starting the homework and before the lecture. This homework covers specifically Chapter 6 and Chapter 7, Sections 1 thru 5.
2. Start the homework early.
3. Ask questions early. Make sure you know how to do all the problems. Never surrender, giving up is not an option!

Chapter 6: Calculus of variations

1. Problem 6-2
2. Problem 6-6
3. Problem 6-7
4. Problem 6-14

Chapter 7: Lagrangian mechanics

5. A simple pendulum consists of a massless string of length l connected to a mass m . The pendulum swings in the xy plane the presence of gravity with no resistive forces (conservative system).
 - a) Using the Lagrange equation derive the differential equation that describes the motion of the mass.
 - b) The differential equation you get from Lagrange equation/Hamilton's principle is no different that what you would get with Newton's laws. Write an explanation that justifies why one gets the same differential equation from these two different "formalisms" of mechanics.
6. A mass m is connected to a spring of constant k . The mass experiences simple harmonic motion in one dimension in the absence of any resistive forces and gravity (a conservative system). Using the Lagrange equation derive the differential equation that describes the motion of the mass.
7. Problem 7-1
8. Problem 7-3
9. Problem 7-7
10. Problem 7-11