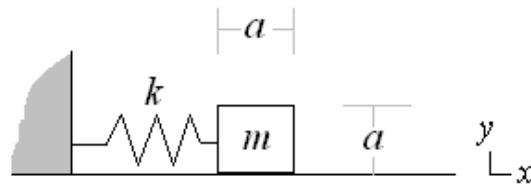


PHY 3010 – Fall 2007
Homework Set #6
DUE: 10/31/2007

Using the method of Lagrange's Equations with Undetermined Multipliers, find the (i) equations of motion and (ii) the forces of constraint for...

1. An ideal plane pendulum with a massless string of length b and mass m .
2. A mass, m , attached to a spring of spring constant, k on a smooth horizontal surface as shown.



3. T&M, 7.22.
4. T&M, 7.23.
5. T&M, 7.24.
6. T&M, 7.25.
7. T&M, 7.26.
8. A block of mass m slides down a frictionless incline of length L which is set at a fixed angle α with the horizontal. It is not free to leave the incline surface. This is a 2-dimensional problem.
 - a. Solve this system using Newton's equations of motion
 - b. Find the Lagrangian, L , of this system.
 - c. Write down your constraint equation(s).
 - d. Write down Lagrange's equations of motion (find your accelerations) – impose constraint(s) to L explicitly (prior to solving LEMs).
 - e. Now, find any forces of constraint.
 - f. Find the Hamiltonian using the equation:

$$H = \sum_j p_j \dot{q}_j - L$$

- g. Find Hamilton's equations of motion and show they produce the same results as in (a.) and (d.).
- h. Show that the Hamiltonian is the same as the total energy either by showing that H satisfies the necessary conditions or by evaluating $H=E=T+U$ explicitly.