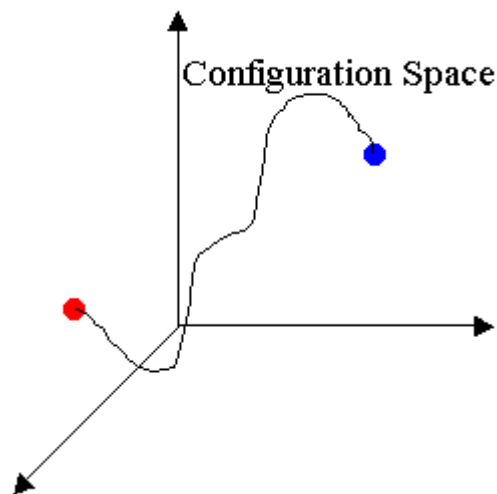
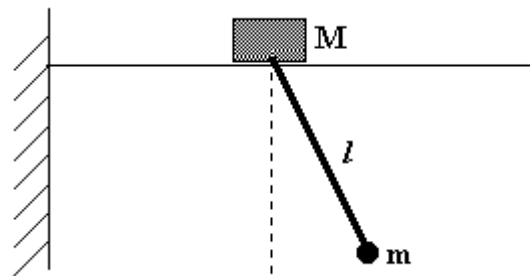


Name:etp Section:M2 Start Time:9:17:7 Instructor:pate Course:355

1) Hamilton's Principle says that a dynamical system traces out a path that minimizes the time integral of the difference between the kinetic and potential energies. Please try to explain this **in your own words**. What is the "path of the system" to which the statement refers? (Hint: Think about how you'd try to explain this to a fellow physics major who comes to you and asks you to decipher the textbook-ese for him or her.)



2) Probably the thing that takes the most practice in order to develop expertise in using "Lagrangians" (also called "Lagrange functions") is figuring out what generalized coordinates are best to choose. There are many 'correct' sets of generalized coordinates for a given system, but some yield differential equations that are easier to interpret than others.



Consider the system shown in the figure to the right. A mass  $M$  is free to slide on a horizontal frictionless air track. Suspended by a pivot and a light rod of length  $l$  is another mass  $m$ . (The pivot is attached in a clever way to the bottom of mass  $M$  so that the whole system can slide freely along the air track surface.)

Suppose you want to determine the equations of motion for this system, and that you might like to determine the angular frequency  $\omega$  of the system for small oscillations.

What might be good generalized coordinates to choose? (How many would you need/pick, and exactly what would they be? Please describe/define them as carefully as you can, explaining your reasoning for your choices.)

### 3) Hamilton's Principle



- a.  is restricted to systems subject only to conservative forces.
- b.  is really the same thing as Euler's equation.
- c.  is less general than Newton's Laws of motion but is still useful for many kinds of problems.
- d.  is especially convenient because it involves only scalar quantities

---

Below is a space for your thoughts, including general comments about today's assignment (what seemed impossible, what reading didn't make sense, what we should spend class time on, what was "cool", etc.):

**You may change your mind as often as you wish. When you are satisfied with your responses click the SUBMIT button.**

- I received no help from anyone on this assignment.
- I received help from someone on this assignment (document in comments section).

Submit Preflight

