

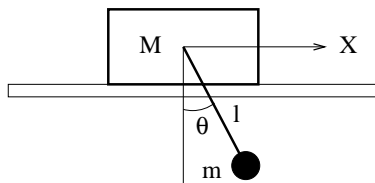
**Physics 106a: Classical Mechanics**  
**Homework 5: Small Oscillations**

**Due: Thursday, November 11, 1999**

Recommended reading: Goldstein pp. 243 – 249, 253 – 269

1. (*Double Pendulum Again.*) Goldstein 6.2

2. (*Pendulum attached to a block.*) A pendulum with mass  $m$  is attached to a block of mass  $M$  as shown in the figure. The block is free to move without friction on a horizontal table. There are two degrees of freedom,  $X$ , and  $\theta$ . Find the normal mode frequencies and mode vectors.



3. (*5-atom linear molecule.*) Goldstein 6.6

4. (*Two masses coupled by springs.*) Goldstein 6.12

(*Extra Credit.*) Goldstein 6.7