MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Department of Physics

Physics 8.01L **Fall 2005**

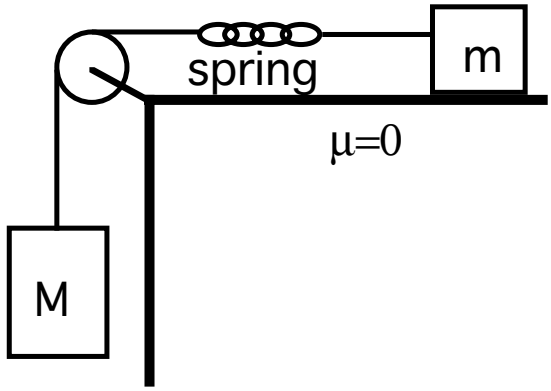
Problem Set 5: Newton's Laws and Friction

Due Friday, October 21 at the start of class at 10am.

Please write your name, recitation number, table number, and tutor name on the top right corner of the first page of your homework solutions. Please place your solutions in the Problem Set Solution hand-in bin at the entrance of the classroom.

Reading:
Young & Freedman Chapter 5 (All sections, but especially section 5.4)

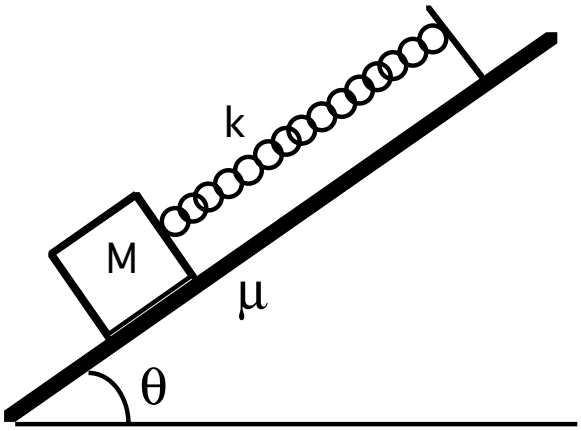
Problem 1 Springs and Pulleys
Two masses (M and m) are connected together by a pulley, two strings, and a stretched spring (with spring constant k) as shown. Assume that the strings, pulley, and spring all have negligible mass and that friction in the pulley and on the surface can be neglected. Find the amount by which the spring is stretched.



Problem 2 Springs, Inclines and Friction
A box of mass M sits on an incline elevated an angle θ above the horizontal. The mass is held in place by a spring (of spring constant k) as shown. Assume that the coefficient of static friction between the box and the incline is μ.

a) Find the maximum amount that the spring can be *stretched* if the mass is to remain stationary on the incline.

b) Find the maximum amount that the spring can be *compressed* if the mass is to remain stationary on the incline.



Problem 3 Giant Swing
Young & Freedman Problem 5.46 (Page 197)

Problem 4 Looping Plane
Young & Freedman Problem 5.51 (Page 198)

Problem 5 Swinging Block
Young & Freedman Problem 5.104 (Page 203)

Problem 6 Spindletop
Young & Freedman Problem 5.111 (Page 204)

Problem 7 Sliding Bead
Young & Freedman Problem 5.115 (Page 204)

Problem 8 Sliding Wedge and Block
Young & Freedman Problem 5.121 (Page 206)
(This looks harder than it is. Think carefully about accelerations and forces on each of the two objects.)