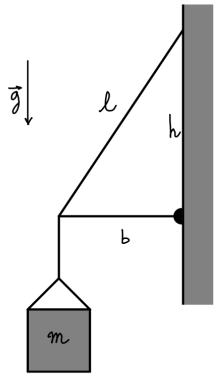
Midterm 2

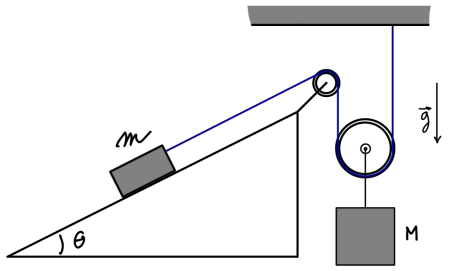
(I) A mass m is hanging at the end of a horizontal beam of length b whose end is supported by a cable of length l. The horizontal beam is elastic with a spring constant k. Both the beam and the cable are secured to the same vertical wall, one vertically above the other at a distance h as indicated on the figure. The beam is attached to the wall via an articulated bracket. If it were not for the cable, the beam would be hanging down.



(a) *[25 pts.]* Find the tension of the cable.

(b) *[25 pts.]* Find the change in length of the beam as a result of the stress due to the hanging mass. Clearly indicate if the length of the beam is increased or decreased.

(II) *[35 pts.]* Consider the contraption represented by the figure. The kinetic friction coefficient between the ramp and the block is μ.



(a) *[40 pts.]* Find the acceleration of the block of mass m

(b) *[10 pts.]* Find the tension of the rope running through the pulleys.