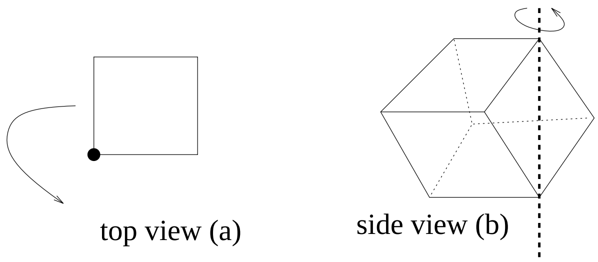
Classical Mechanics | **Professor Scalise**
Fall 2000 | **Mid-term Examination**

Name: ________________ ID number:________________

Show your work to receive partial credit. Box final answers.

1. Find the moment of inertia (zz-component) of a cube of mass M and side b about an axis
   (a) along one of the edges
   (b) along one of the face diagonals



2. A bead of mass m slides on a frictionless vertical circle of wire of radius R in a gravitational field.
   (a) How many degrees of freedom are there?
   (b) Compute the equations of motion using Lagrange indeterminate multipliers.
   (c) Find and interpret the force of constraint.

3. A simple pendulum of length ℓ and mass m in a gravitational field is attached to a support moving vertically upward with acceleration a.
   (a) What are the x- and y-components of the bob's velocity?
   (b) Write the equation of motion without using Lagrange indeterminate multipliers. (Make all the substitutions first, in the Lagrangian.)
   (c) Determine the frequency of small oscillations. Interpret.