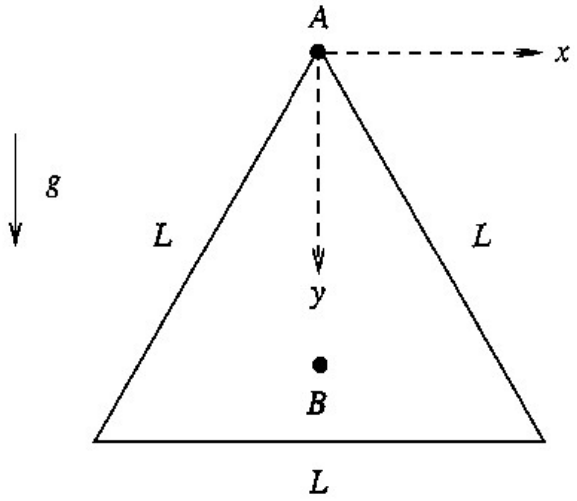
FP5

A thin uniform plate (mass M), in the shape of an equilateral triangle (side L), is suspended from one vertex (at A in the figure), forming a physical pendulum. The triangle swings about an axis perpendicular to the plate through point A. Take $x-y$ coordinates as shown, so that $w(y) = \frac{2}{\sqrt{3}}y$ is the width of the triangle a vertical distance y from A. Our goal is to calculate the period for small oscillations about A.



a) (3 points) Find the coordinated of the center of mass (x_{cm},y_{cm}). *Hint:* One method involves breaking the triangle into horizontal strips of mass dm and then integrating. There is also a symmetry argument.

b) (4 points) Calculate the moment of inertia I_A about the axis through A. *Hint:* Apply the parallel axis theorem to each horizontal strip and then integrate.

c) (2 points) What is the period of small oscillations about A? Leave your answer in terms of I_A if you were unable to solve part (b).

d) **Extra Credit** (2 points) We now move the suspension to a second point B on the y axis such that, when the system is inverted, small oscillations have the same period as about A. Find the coordinates y_B of this point relative to the coordinate system centered on point A.