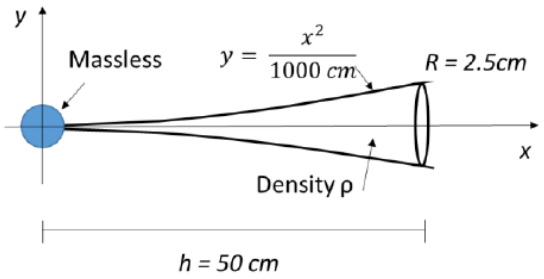
A new juggling cone:

To the right is a possible shape for a juggling cone. The shape of the cone is given by the equation $y = bx^2$ where $b = 10^{-3}cm^{-1}$. The toy is 50cm long and the base has a diameter of 5cm. The perfectly spherical top is made of an ultralight foam. The density of the cone is $\rho = 1g / cm^3$.



Option 1:

a) What is the mass of this toy?

b) Where is the center of mass?

c) What is the moment of inertia around the x axis?

Important Concepts from Chapter 12.4

The Center of Mass of a set of discrete particles can be found using the equation:

$$x_{cm} = \frac{\sum_i x_i m_i}{\sum_i m_i}$$

For a continuous distribution of particles the center of mass equation becomes:

$$x_{cm} = \frac{\int x dm}{\int dm}$$

The Moment of Inertia of particle about an axis of rotation is given as $I = mr^2$.

Moments of Inertia of add. Amongst other things, this means that the Moment of Inertia of a continuous distribution of particles can be found be calculating

$$I = \int r^2 dm$$