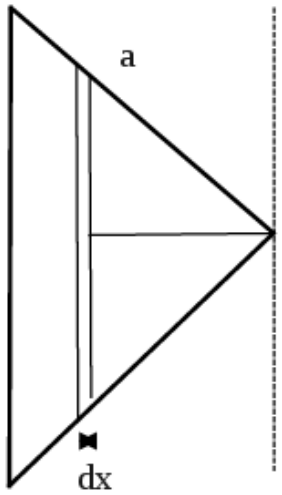
Physics 1210
Homework 8 Written-out Problems

1.

A piece of metal, with mass M, is shown below rotating about the dotted-line axis. The two equal sides of the triangle have length "a" as shown. The long side is a√2. Compute the moment of inertia of the object given this axis, by integrating the mass distribution from x=0 to $x = \frac{a}{\sqrt{2}}$.



A. First express the surface mass density Σ (mass per unit area) in terms of the given variables.
B. Then express the relationship between each unit of mass dm and Σ times the length of each strip times dx.
C. Finally integrate by dx and show that the moment of inertia is

$$I = \int x^2 dm = \frac{1}{4} M a^2$$

2.

A. In an effort to find new energy markets, your boss proposes utilizing the Earth's rotation and demands that you calculate how much rotational kinetic energy is stored in the Earth. (For problem 2 please informally cite where you get the values you look up.)

B. Worried about the ethics of changing how long a day is, but interested yourself, you calculate how much the rotational period of the earth would change over 100 years assuming a constant demand of energy equal to the current world demand. Express the final value as the fractional change in rotational period.