

Volumes via Calculus

Math 1A, section 103

April 29, 2014

0. (Warmup.) Use an integral to find the volume of a cube of side length 3.
1. Use integrals to derive the formulas for the volume of a sphere and the volume of a cone.
2. A cylindrical hole of radius 7 is drilled straight through a sphere of radius 11 along a diameter. What is the volume of the remaining solid?

3. A dome-shaped (hemispherical) building is 20 feet high and has two floors, each 10 feet high. What is the volume of the region on the second floor (below the ceiling)?

4. An ellipsoid is the volume of revolution formed by revolving an ellipse about its longer axis (like an egg shape). What is the volume of an ellipsoid that has longest radius r and shortest radius s ? Hint: The equation of an ellipse with these dimensions is

$$\left(\frac{x}{r}\right)^2 + \left(\frac{y}{s}\right)^2 = 1$$