Emory University Department of Mathematics & CS
Math 211 Multivariable Calculus
Fall 2011

Problem Set # 10 (due Friday 18 November 2011)

Reading: CM 16.4-7

1. CM 16.5 Problems 34, 37 (above the cone, below the sphere), 49

2. CM 16.7 Exercise 2, 4, 6
Problems 16, 20, 26,

3. Sketch, and find the volume of, the region (if in doubt, the region that's smaller) between the surfaces $x^2 + y^2 = 4z$ and $x^2 + y^2 + z^2 = 5$.

4. (Extra Credit) Define

$$R_1 = \{(\rho, \theta, \phi) \, : \, 0 \leq \theta \leq 2\pi, \, 0 \leq \phi \leq \pi/2, \, 0 \leq \rho \leq \cos(\phi)\}$$

and

$$R_1 = \{(\rho, \theta, \phi) \, : \, 0 \leq \theta \leq 2\pi, \, 0 \leq \phi \leq \pi/2, \, 0 \leq \rho \leq \sin(\phi)\}$$

and let Φ be the spherical coordinate mapping. Sketch $\Phi(R_1)$ and $\Phi(R_2)$ and compute their volumes.

5. (Extra Credit) Let T in $\mathbb{R}^3$ be the solid torus (i.e. doughnut) formed by spinning around the z-axis a disk of radius r centered at $(a, 0, 0)$ in the x-z-plane. Of course, assume $0 < r < a$ otherwise you don't get a torus. Compute the volume of T.
Hint: try cylindrical coordinates.

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