Emory University Department of Mathematics & CS
Math 211 Multivariable Calculus
Spring 2012

Problem Set # 10 (due Friday 20 April 2012)

Reading: CM 16.4-7

1. CM 16.5 Exercises 12, 13, 14, 18 (place these regions anywhere you find most convenient in $\mathbb{R}^3$)

Problems 31, 32, 33, 37 (above the cone and below the sphere), 38, 40, 49

2. This has been moved to HW 11.

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) 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.

5. (Extra Credit) Remember the following triple integral from lecture

$$\int_{x=-1}^{1} \int_{y=-\sqrt{1-x^2}}^{\sqrt{1-x^2}} \int_{z=-\sqrt{1-y^2}}^{\sqrt{1-y^2}} dz dy dx.$$

Compute it in two ways:

a) First, exchange the order of integration of the outer two most integrals. Now if you were in class on Thursday April 12th, you should recognize this integral and know it's volume. If you skipped that day, google the phrase "steve strogatz it slices it dices" and find out.

b) Second, compute it the way it's presented without changing the order of integration. You are allowed to change to polar coordinates. (It might be a good time to brush off the inverse trig substitutions).

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