Math 53 Homework 9

Due Tuesday 11/1/11 in section

(The problems in parentheses are for extra practice and optional. Only turn in the underlined problems.)

Monday 10/24: Triple integrals in cylindrical coordinates; applications

- **Read:** section 15.6 from p. 995; section 15.7.
- **Work:** 15.6: (37), (41), <u>44</u>, (51), <u>52</u>.
  15.7: (1), <u>9</u>, <u>15</u>, (17), <u>18</u>, (21), <u>22</u>, (23), (24).
  <u>Problem 1</u> below.

(Note: feel free to use cylindrical coordinates – or not – for the problems in 15.6.)

Wednesday 10/26: Triple integrals in spherical coordinates

- **Read:** section 15.8.
- **Work:** 15.8: (5), (7), <u>9</u>, (13), <u>14</u>, <u>15</u>, (17), <u>19</u>*, <u>23</u>, (25), (29), <u>30</u>, <u>33</u>, <u>35</u>, (39).
  <u>Problem 2</u> below.

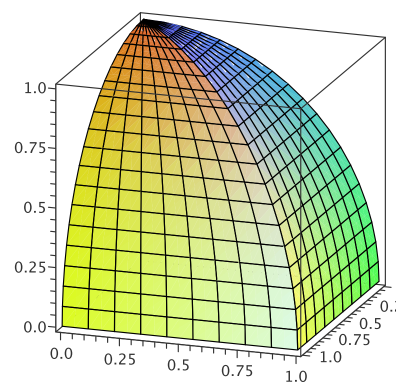
* For 15.8 # 19: set up the integral *both* in cylindrical and in spherical coordinates.

Friday 10/28: Vector fields

- **Read:** section 16.1.
- **Work:** 16.1: (5), <u>11</u>, <u>13</u>, (15), <u>18</u>, (21), <u>26</u>, <u>31</u>.

Problem 1.

The picture shows the portion of the solid formed by the intersection of the solid cylinders $y^2+z^2 \le 1$ and $x^2+z^2 \le 1$ (two cylinders of radius 1, centered on the x-axis and on the y-axis respectively) which lies in the first octant ($x \ge 0$, $y \ge 0$, $z \ge 0$). The front "face" is a portion of the cylinder $x^2+z^2=1$, while the right "face" is part of the cylinder $y^2+z^2=1$.



Find the volume and the centroid $(\bar{x}, \bar{y}, \bar{z})$ (= center of mass with uniform density $\rho = 1$) of the pictured solid. (Hint: the integral is easier to set up in the order $dx\,dy\,dz$).

Problem 2. Recall that the *average value* of $f(x,y,z)$ over a region D in space is

$$\frac{1}{V(D)} \iiint_D f(x,y,z)\,dV, \quad V(D) = \text{ volume of } D$$

Set up the integral *both* in cylindrical and spherical coordinates for the average distance from a point in the solid sphere of radius a to a point on the surface, and evaluate both integrals. Put the point on the surface at the origin and make it the South pole of the sphere.