Math 53 Homework 9

Due Wednesday 3/30/16 in section

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

Monday 3/14: Change of variables in double integrals

- **Read:** section 15.9 to the bottom of p. 1058.[1]
- **Work:** 15.9: (1), (3), (7), 15, (17), 19, 23, (24)[2]; Problem 1 below.

Wednesday 3/16: Triple integrals in rectangular coordinates

- **Read:** section 15.6. [7th ed: section 15.7]
- **Work:** 15.6: (3), (9), 13, 15, (17), 18, (22), (27), 33, 35.[3]

Friday 3/18: Triple integrals in cylindrical coordinates; applications

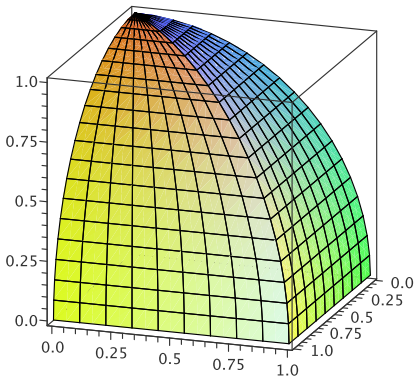
- **Read:** section 15.7. [7th ed: section 15.8]
- **Work:** 15.6: (39), (43), 46, (53), 54.[4] (feel free to use cylindrical coordinates!)
  15.7: (15), (17), (19), 21, 22, (25), (26), 30.[5]
  Problem 2 below.

Problem 1.

Using the coordinate change $u = xy$, $v = y/x$, set up and evaluate an iterated integral for the polar moment of inertia (with density $\rho = 1$) of the region bounded by the hyperbola $xy = 1$, the x-axis, and the two lines $x = 1$ and $x = 2$. Choose the order of integration which makes the limits simplest.

Problem 2.

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 $y^2 + z^2 = 1$.



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 $dx\,dy\,dz$).

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[1] **6th ed:** section 15.9 to the end of p. 1018; **7th ed:** section 15.10 to the middle of p. 1046.

[2] **6th ed:** 15.9: (1), (3), (7), 11, (13), 15, 19, (20); **7th ed:** 15.10: (1), (3), (7), 15, (17), 19, 23, (24).

[3] **6th ed:** 15.6: (3), (9), 11, 15*, (17), 18, (21), (27), 33, 35.
7th ed: 15.7: (3), (9), 13, 15*, (17), 18, (22), (27), 33, 35.
*do the 8th ed problem: $\iiint_T y^2\,dV$, T solid tetrahedron with vertices (0,0,0), (2,0,0), (0,2,0) and (0,0,2).

[4] **6th ed:** 15.6: (37), (41), 44, (51), 52**. **7th ed:** 15.7: (39), (43), 46, (53), 54**.
**do the 8th ed problem: average height of the points in the solid hemisphere $x^2 + y^2 + z^2 \le 1$, $z \ge 0$.

[5] **6th ed:** 15.7: (15), (17), (19), 21, 22, (23), (24), 28. **7th ed:** 15.8: (15), (17), (19), 21, 22, (25), (26), 30.