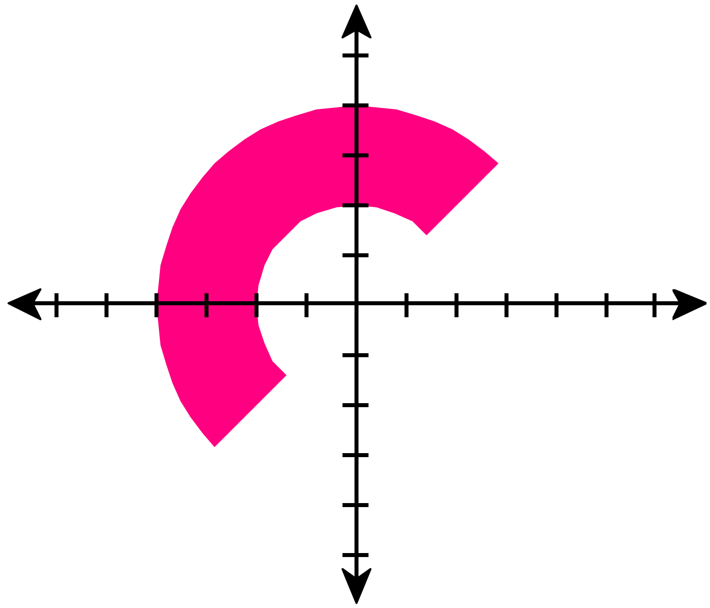
Exam 2 Calc 3 10/26/2007

Each problem is worth 10 points. For full credit provide complete justification for your answers.

1. Set up limits of integration in polar coordinates for the integral of a function g on the region R shown below:



2. Set up limits of integration for a double integral to compute $\iint_R f(x,y)\,dA$, where R is the triangle with vertices (0,0), (3,0), and (3,3).

3. Find the Jacobian for the transformation $x = u^2 + v^2$, $y = u - v$.

4. Set up an iterated integral for the volume of a sphere (centered at the origin) of radius 3 with a cylinder of radius 2 (centered along the z- axis) removed.

5. Set up an iterated integral for the surface area of the part of the plane $3x + 2y + z = 6$ that lies in the first octant.

6. Evaluate $\int_0^3 \int_{y^2}^9 y \cos\left(x^2\right) dx\, dy$.

7. Bunny is a calculus student from Enormous State University, and she has a question. Bunny says "So, I really studied hard this chapter, and it's amazing how much more interesting math is when you actually understand it! But there's one thing I was wondering about with, like, changing to polar and stuff. I know there are times when it's lots easier to set something up in x and y, right, and times when it's lots easier in polar. But are there times when you'd really *have* to use x and y, like where polar wouldn't work no matter what, or is it just about what's easier?"

   Answer Bunny's question.

8. Set up integrals for the z coordinate of the center of mass of the portion above the xy-plane of the region between a sphere with radius 1 and a sphere with radius 3 (both centered at the origin).

9. Evaluate $\iiint_E 2\,dV$, where E is the region bounded between $y = x^2 + z^2$ and $y = 4$.

10. Let a be some constant. What can you say about the volume of the region in the first octant above $z = a$ but below $z = \dfrac{1}{\sqrt[3]{xy}}$?

Extra Credit [up to 5 points possible]: Find the volume of the region bounded between $z = x^2 + y^2$ and $y = x^2 + z^2$.