Quiz #08 – MATH 2421
Fall 2007

Puhalskii Name : _____

Directions: No calculators, books, or notes. Show algebra. Be sure to highlight your final answer!
$r^2 = x^2 + y^2,\ x = r\cos(\theta)\,,\ y = r\sin(\theta)\,.$

1. [4 *pts*.] The surface area differential is

$$dS = \sqrt{1 + (f_x)^2 + (f_y)^2}\ dA.$$

Suppose we have the upper cone $z = 2\sqrt{x^2 + y^2}$. Find the surface area above the region in the xy-plane R: $x^2 + y^2 \leq 4$.

$r\ dr\ d\theta$

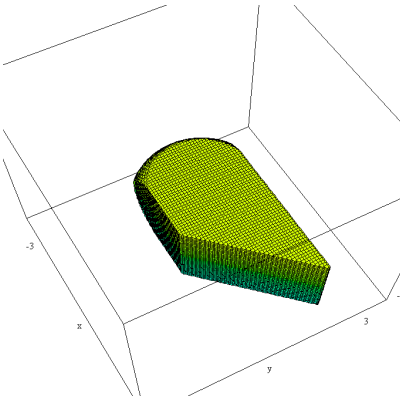
r:

θ:

2. [3 *pts*.] We have a solid Q bounded by the plane $x = y + 2$ and the hemisphere $x = -\sqrt{2 - y^2 - z^2}$.

   The solid is also bounded by the planes $y = -1,\ y = 1,\ z = -1$, and $z = 1$.

   Suppose the density function is $\sigma(x, y, z) = x^2 + 2z^2$.



There is only ONE reasonable choice for the variable of integration in the INNER integral.

Set up but DO NOT EVALUATE the TRIPLE INTEGRAL which represents the mass:

$$m = \iiint_Q \sigma(x, y, z)\ dV$$

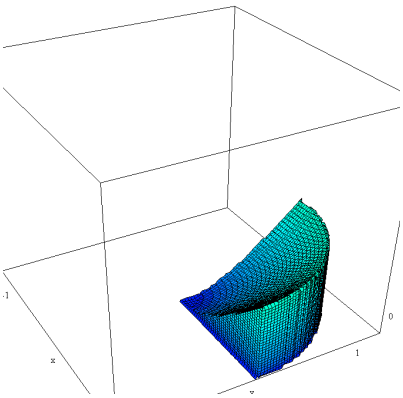
3. [3 *pts*.] Suppose we have the surface of revolution

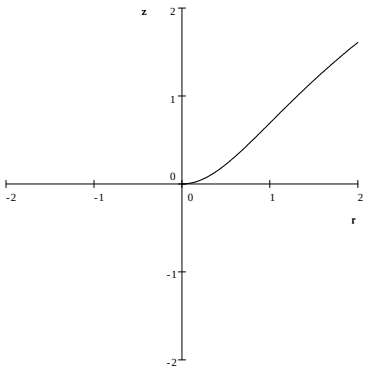
$$z = \ln\left(1 + x^2 + y^2\right) = \ln\left(???\right).$$

Hint: This is easy to transform into cylindrical coordinates. [The rz-plane generating curve is given below as an added hint.]

The solid Q traps the volume *beneath* this surface, above the circular region $x^2+y^2 \leq 1$ ONLY IN QUADRANT I.

The density function is $\sigma(x, y, z) = x + y$.





Set up but DO NOT EVALUATE the CYLINDRICAL COORDINATES TRIPLE INTEGRAL which represents the mass.

$dz\ r\ dr\ d\theta$

z:

r:

θ: