Name: _____

Write all your work and solutions on the extra paper provided and hand it in with this exam paper. Please put your name on each page in case the pages get separated.

1. (*20 Points*): Set up **and evaluate** the double integral of $f(x, y) = x^2 \sin^3(y)$ over the domain $D = [0, 3] \times [0, \pi/2]$.

2. (*15 Points*): Set up **but do not evaluate** the double integral that will find the volume under the surface $f(x, y) = xy$ and above the triangle with vertices $(1, 1)$, $(4, 1)$, and $(1, 2)$.

3. (*15 Points*): Set up **but do not evaluate** the integral that will find the volume of the object above the cone $z = \sqrt{x^2 + y^2}$ and below the sphere $x^2 + y^2 + z^2 = 1$. Write the integral using polar coordinates. Image of the object is below.

4. (*15 Points*): Set up **but do not evaluate** the integrals that will find the center of mass $(\bar{x}, \bar{y})$ of the lamina that occupies the region enclosed by the curves $y = 0$ and $y = \cos(x)$, with $-\pi/2 \leq x \leq \pi/2$ and density function $\rho(x, y) = x^2 e^{-y}$.

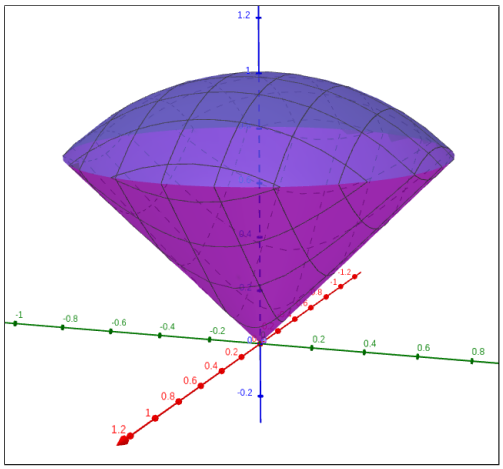
5. (*15 Points*): Set up **but do not evaluate** the integral that will find the surface area of the part of the surface $z = 1 + x^2 y^2$ that lies above the disk $x^2 + y^2 \leq 1$.

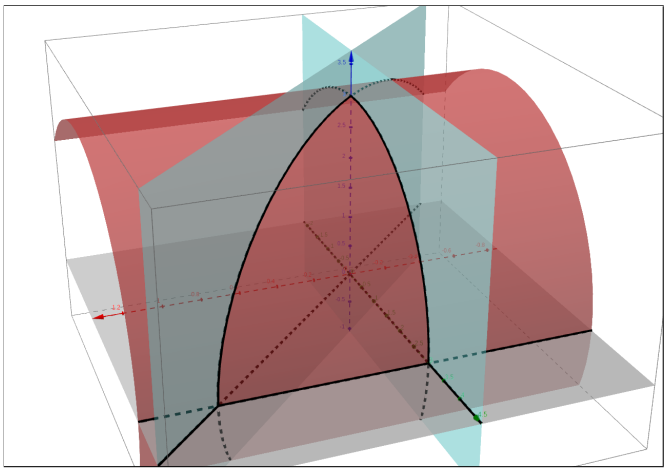
   (a) Set this up in rectangular coordinates.

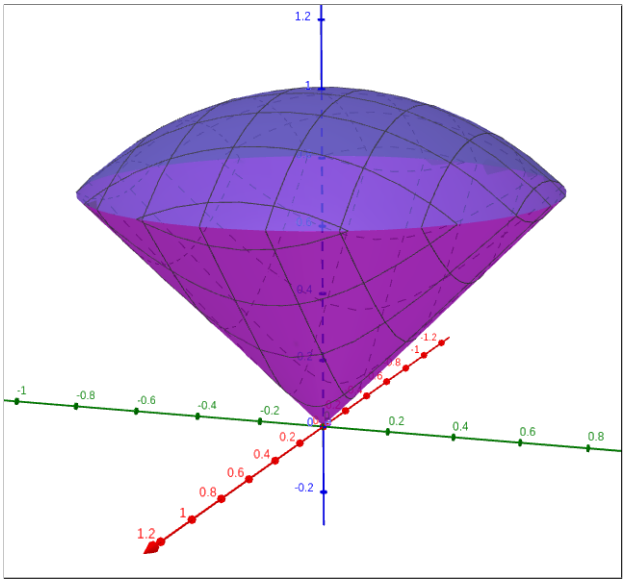
   (b) Set this up in polar coordinates.

6. (*20 Points*): Set up **and evaluate** $\iiint_E z \, dV$ where E is bounded by the cylinder $y^2 + z^2 = 9$ and the planes $x = 0$, $y = 3x$, and $z = 0$ in the first octant. Image of E is below, the first octant is facing you.

7. **Extra Credit** (*10 Points*): Do the integral from #2 or #3, just do one of them.






1.2
1
0.4
-0.2
-1
-0.8
-0.6
-0.4
-0.2
0.2
0.4
0.6
0.8
-1.2
-1
-0.8
-0.6
-0.4
-0.2
0.2
0.4
0.6
0.8
1
1.2