Embry-Riddle Aeronautical University **Dr. E. Jacobs**
MA 243 *Calculus III* **Exam III** **Sample Exam**

1. Let Q be the region in the xy plane that is above the x-axis but inside the ellipse $x^2 + \frac{y^2}{4} = 1$. Find the y-coordinate of the centroid.

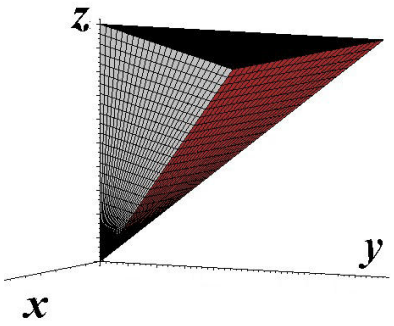
2. Let $\mathcal{D}$ be the region in the xy-plane that is bounded by $y = x^2$ and $x = y^2$. Find the *surface area* of the portion of the plane $z = 4 + x + y$ that is directly above $\mathcal{D}$.

3. Let $\mathcal{T}$ be the triangle with vertices (0, 0, 0), (3, 3, 0) and (0, 3, 0). Express the volume of the region below the plane $z = 3 - y$ and above $\mathcal{T}$ as a triple integral. Use the $\iiint(\quad)\, dz\, dy\, dx$ order of integration. **Set-up only. No antiderivatives necessary.**

4. Convert to polar coordinates and calculate the double integral.

$$\int_0^{\infty} \int_{-y}^{y} e^{-x^2-y^2}\, dx\, dy$$

5. Use a triple integral to calculate the volume of the tetrahedron with vertices $(0, 0, 0)$, $(0, 0, 2)$, $(0, 2, 2)$ and $(2, 2, 2)$



6. Let T be the region bounded by the cone $z = \sqrt{x^2 + y^2}$ and the plane $z = 2$. Express the volume of T as a triple integral in cylindrical coordinates. **Set-up only. No antiderivatives necessary.**

7. Let $\mathcal{H}$ be the three dimensional region inside the sphere described by the equation $x^2 + y^2 + z^2 = 4$ for $y \geq 0$. Express $\int\int\int_{\mathcal{H}} y\, dV$ in spherical coordinates and also in cylindrical coordinates. **Set-up only. No antiderivatives necessary.**