Team Homework 7

1. There is a bounded region in $\mathbb{R}^3$ that lies above the paraboloid $z = x^2 + y^2 + 2$ but below the cone $z = 3\sqrt{x^2 + y^2}$. Set up an iterated integral, including limits of integration, for the volume of this region.

2. For each of the following triple integrals, draw the region in $\mathbb{R}^3$ over which the integral is being evaluated. Do not evaluate the integrals.

   (a) $\displaystyle\int_0^3 \int_{-2}^4 \int_0^{\sqrt{9-x^2}} y^2 \, dz \, dy \, dx.$

   (b) $\displaystyle\int_{-3}^3 \int_{-\sqrt{9-y^2}}^{\sqrt{9-y^2}} \int_{\sqrt{x^2+y^2}}^{9-\sqrt{x^2+y^2}} z^2 \, dz \, dx \, dy.$

   (c) $\displaystyle\int_{-2}^2 \int_0^{2-y} \int_0^{5-z} (x^2 + y^2) \, dx \, dz \, dy.$

3. A solid pyramid T in $\mathbb{R}^3$ has vertices $(0, 0, 0)$ $(4, 0, 0)$, $(4, 4, 0)$, $(0, 4, 0)$, and $(0, 0, 2)$. Let $f(x, y, z)$ be a continuous function on T. Set up an integral, complete with an order of integration and limits of integration for each variable, for $f(x, y, z)$ over the solid region T.